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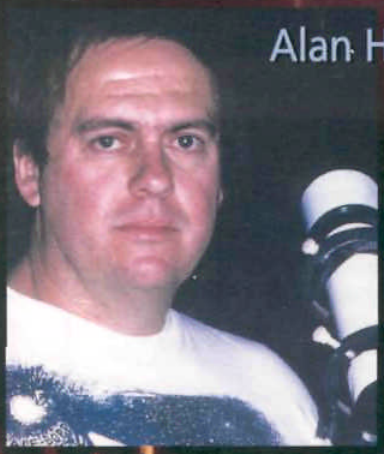
Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

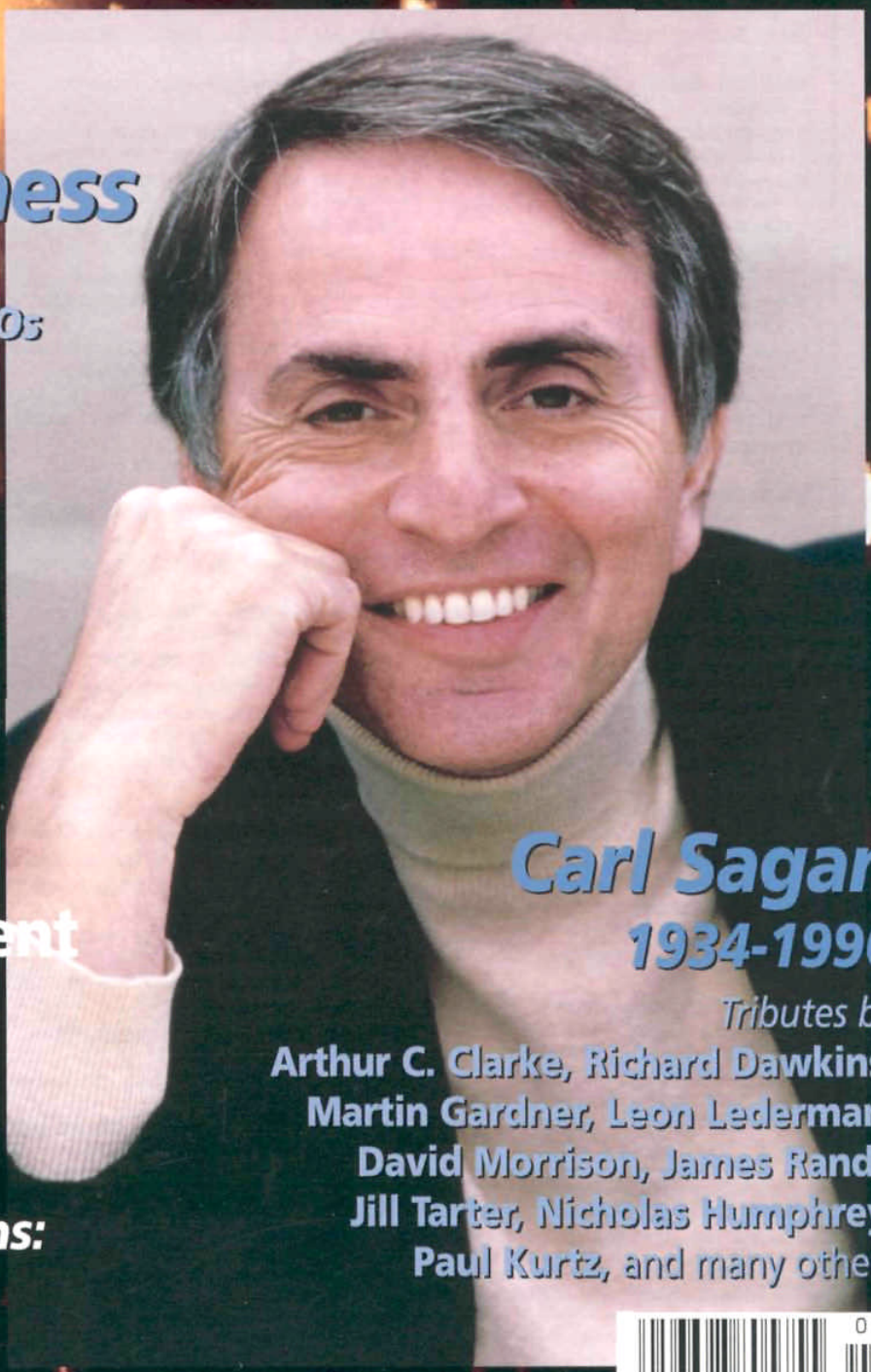
Volume 21, No. 2 • **March/April 1997**

Hale-Bopp Comet Madness

plus An Astronomer's Personal Statement on UFOs



Alan Hale



Carl Sagan 1934-1996

Tributes by
Arthur C. Clarke, Richard Dawkins, Martin Gardner, Leon Lederman, David Morrison, James Randi, Jill Tarter, Nicholas Humphrey, Paul Kurtz, and many others

Biases of Everyday Judgment

Thomas Gilovich

The End of Science?

Theodore Schick Jr.

The Book of Predictions: 15 Years Later

Alan M. Tuerkheimer & Stuart A. Vyse

Published by the Committee for the Scientific Investigation of Claims of the Paranormal

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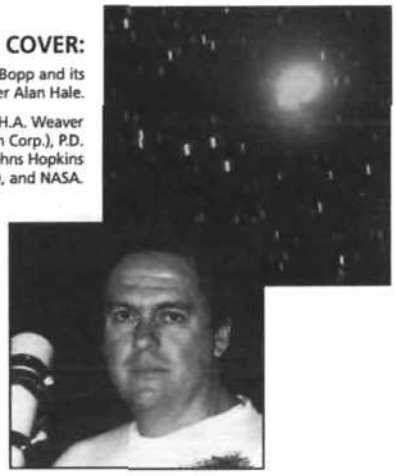

ON THE COVER:
Comet Hale-Bopp and its co-discoverer Alan Hale.

Comet photo: H.A. Weaver (Applied Research Corp.), P.D. Feldman (The Johns Hopkins University), and NASA.

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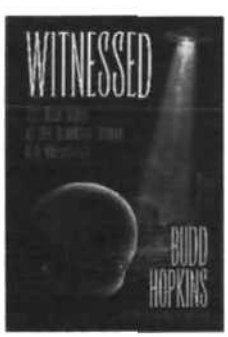

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EDITOR'S NOTE

Everyone's Astronomer

It is hard to believe that Carl Sagan is gone. During his brilliant but too brief career he shone like a nova. He cast light everywhere, and it was the light of curiosity, intelligence, reason, common sense, and compassion. He exemplified the joy and exuberance of science. He was successful more than any other scientist of his time in reawakening in adults everywhere their lost childhood passion for learning and sense of wonder at the natural world. He was the kind of science teacher everyone would have wanted but few have had.

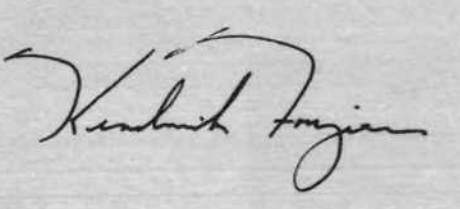
He brought people and fields of human expression together—different fields of science; scientists and the general public; the sciences and art, music, literature, and poetry; he even worked to find areas of agreement between science and mainstream religion. The foremost planetary scientist of the golden age of planetary exploration—when we sent the first unmanned emissaries of Earth to all the planets and many of their moons—he eloquently chronicled our first tentative steps out into the universe and truly made us feel our "cosmic connection." As he said, "We are all made of star-stuff."

I think his unique art was his ability—and determination—to bring the average person into the realm of science. Through his many forums, he talked directly to people about science, and they appreciated that. In the weeks since his death, there have been genuine and widespread expressions of grief among diverse people who ordinarily wouldn't give a second thought to the passing of a scientist. He suffered opprobrium from some colleagues in the scientific community for communicating so much with the public, but in retrospect most now see that his efforts were of extraordinary value to science.

Science is for everyone, he steadfastly believed—not just its technological fruits but its intellectual discoveries, its processes. People's minds can be nourished by exposure to the wonders and discoveries of science. And he strongly felt that a democratic society needs the general population—not just the scientific elite—to have some familiarity with scientific issues to be good citizens. He worked hard to make that happen.

He was of course also an ardent foe of pseudoscience, but not a strident one. I first saw him in action in this regard at the famous Velikovsky symposium at the AAAS meeting in San Francisco in 1974. It was, in a way, an epic clash, the aging Immanuel Velikovsky (*Worlds in Collision*), white hair flowing like a modern Moses, and the young, articulate, well-informed astronomer who had, over opposition from some of his scientific colleagues, championed the symposium. It came off well, received enormous publicity, and seemed to have marked a turning point away from that particular brand of pseudoscience. Carl never gave up the effort to promote open-minded skeptical inquiry and to help people see the differences between genuine science and pseudoscience, but he always carried it out with grace and dignity—and compassion for believers.

In this issue we present a special tribute to Carl Sagan. We invited a number of his friends and colleagues to express their thoughts. So many tributes have been received that we have been unable to publish them all in this issue; we hope to present more in succeeding issues. We would appreciate your contributions too. He was for everyone.



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The Darkened Cosmos:
A Tribute to Carl Sagan

One of the world's strongest and most eloquent voices for science and reason has been silenced forever.

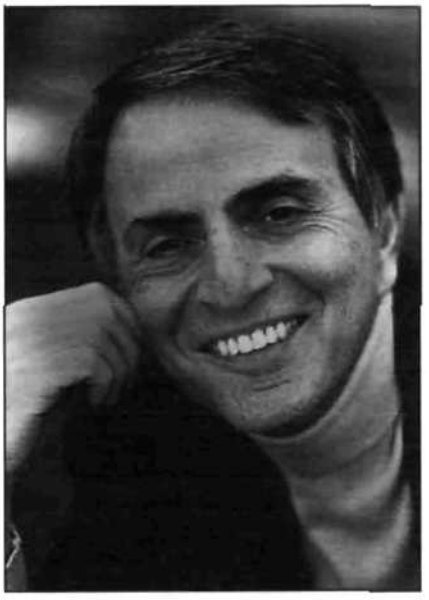
Carl Sagan died December 20 in a Seattle hospital at the age of sixty-two after a two-year battle with the bone marrow disease myelodisplasia. One of the world's great popularizers of science, Sagan was a preeminent scientist, educator, author, skeptic, and humanist. He was also a founding member and fellow of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP).

Sagan's award-winning 1980 TV series *Cosmos* and best-selling book by the same name turned the ebullient planetary astronomer into an international celebrity. The thirteen-part TV series explored scientific understanding of fifteen billion years of cosmic evolution from the Big Bang to the origin of life and human consciousness.

Sagan's presentation of his subject was so fascinating and comprehensible that *Cosmos* attracted an audience of over half a billion people in sixty countries. The book from the series spent seventy weeks on the *New York Times* best-seller list, including fifteen weeks at number one.

Sagan's career as a popularizer began in the early 1970s when he started publishing science books aimed at a lay audience and made his first of twenty-five appearances on NBC's *Tonight Show*. His book *The Dragons of Eden: Speculations on the Evolution of Human Intelligence* won the Pulitzer Prize for Literature in 1978.

He continued his work as a popularizer of science and critical thinking right



up until the end of his life. In his article in the March 10, 1996, *Parade* magazine, titled "In the Valley of the Shadow," he spoke movingly of his illness and his attitude toward death as a nontheist and skeptic: "I would love to believe that when I die I will live again, that some thinking, feeling, remembering part of me will continue. But much as I want to believe that, and despite the ancient and worldwide cultural traditions that assert an afterlife, I know of nothing to suggest that it is more than wishful thinking.

"The world is so exquisite with so much love and moral depth, that there is no reason to deceive ourselves with pretty stories for which there's little good evidence. Far better it seems to me, in our vulnerability, is to look death in the eye and to be grateful every day for the brief but magnificent opportunity that life provides."

Despite Sagan's fame as popular writer and TV personality, his main career was in science and academia. From 1971 until his death, Sagan was professor of astronomy and space science and director of the Laboratory for Planetary Studies at Cornell University. His main research interests, resulting in hundreds of journal articles, were in planetary atmospheres, the greenhouse effect on Venus, the origin of life on Earth, and the possibilities of extraterrestrial life and intelligence.

Five years ago the American Astronomical Society presented Sagan its Masursky Award for "his extraordinary contributions to the development of planetary science. . . . As a scientist trained in both astronomy and biology, Dr. Sagan has made seminal contributions to the study of planetary atmospheres, planetary surfaces, the history of the Earth, and exobiology. Many of the most productive planetary scientists working today are his present and former students and associates."

He contributed to the Mariner, Viking, Voyager, and Galileo planetary exploration missions that opened new planetary worlds to our view and helped devise the interstellar messages carried aboard the Pioneer 10 and 11 and Voyager 1 and 2 spacecraft. NASA twice awarded him medals, one for Exceptional Scientific Achievement and one for Distinguished Public Service.

Said NASA administrator Dan Goldin at Sagan's death: "As much as any scientific figure of our time, Carl described for an entire generation—the generation of the space age—the true

wonders of the universe around us."

"Sagan understood the need to bring science into American living rooms, to show its relevance to our everyday lives, and to share the excitement and discovery," said Neal Lane, director of the National Science Foundation.

In 1994, the National Academy of Sciences, the nation's most august group of scientists, presented Sagan its Public Welfare Medal, given to "honor extraordinary use of science for the public good." Said Academy president Bruce Alberts: "In the public view, Carl Sagan's name may be associated more with science than that of any other living U.S. scientist. This award clearly honors a very distinguished individual who has played a critical role in promoting the understanding of science worldwide."

One of Sagan's colleagues at Cornell University, Yervant Terzian, said Sagan was "the best teacher of science in the world."

Sagan actively supported the work of CSICOP and was a great fan of SKEPTICAL INQUIRER. In 1987 at CSICOP's conference in Pasadena, he was given CSICOP's In Praise of Reason Award.

In 1994 CSICOP created the Isaac Asimov Award in honor of Asimov's extraordinary contributions to science and humanity. The first recipient of this award was Carl Sagan. It was presented at the 1994 CSICOP Conference in Seattle. The award is in recognition of an individual who throughout his or her life has shown outstanding commitment and ability in communicating the achievements, methods, and issues of science to the public.

When told that the first Asimov award would be presented to Carl Sagan, Janet Asimov said, "There is no one better qualified for the CSICOP Isaac Asimov Award than his good friend and colleague Carl Sagan. Isaac was particularly fond of Carl. He was also in awe of Carl's genius, and proud that he was so adept at communicating science to the public through speaking, writing, and the visual media."

In his keynote address at the Seattle conference, Sagan spoke to an audience of more than a thousand. He spoke about his love of science and the importance of the popularization of science: "Science is still one of my chief joys. The popularization of science that Isaac Asimov did so well—the communication not just of the findings but of the methods of science—seems to me as natural as breathing. After all, when you're in love, you want to tell the world. The idea that scientists shouldn't talk about their science to the public seems to me bizarre."

Paul Kurtz, chairman of CSICOP, said, "Carl Sagan was one of the leading scientific skeptics in the world and a critic of antiscientific and irrational attitudes, and perhaps the leading proponent of the scientific outlook and the methods of science. His untimely loss is deeply felt by the scientific and academic community."

In his last book, *The Demon-Haunted World: Science As a Candle in the Dark*, Sagan wrote:

> I worry that, especially as the Millennium edges nearer, pseudoscience and superstition will seem year by year more tempting, the siren song of unreason more sonorous and attractive. Where have we heard it before? Whenever our ethnic or national prejudices are aroused, in times of scarcity, during challenges to national self-esteem or nerve, when we agonize about our diminished cosmic place and purpose, or when fanaticism is bubbling up around us—then, habits of thought familiar from ages past reach for the controls.
>
> The candle flame gutters. Its little pool of light trembles. Darkness gathers. The demons begin to stir.

Said Kurtz: "I am afraid the world has just become a bit darker."

Carl Sagan is survived by his wife Ann Druyan; two former wives; his sister, Cari Sagan Greene; five children; and a grandson. He will be fondly remembered and sorely missed. Donations in Carl Sagan's name can be made to: The Children's Health Fund of New York (317 East 64th St., New York, NY 10021) or The Carl Sagan Memorial Fund (The Planetary Society, 65 N. Catalina Avenue, Pasadena, CA 91106).

SKEPTICAL INQUIRER invited friends and colleagues of Carl Sagan and others whose lives he touched to share their thoughts about his life and work with our readers. Here are some of those tributes. More will appear in our next issue.

Richard Dawkins

In my review for *The Times* of London of *The Demon-Haunted World*, I mentioned a chapter heading of Carl Sagan's *Cosmos*: "Who Speaks for Earth?" I went on that it was "a rhetorical question that expects no particular answer, but I presume to give it one. My candidate for planetary ambassador, my own nominee to present our credentials in galactic chancelleries, can be none other than Carl Sagan himself. He is wise, humane, polymathic, gentle, witty, well-read, and incapable of composing a dull sentence."

In the *Financial Times* this year, I described him as "a beacon of clear light in a dark world of alien abductions and 'real-life X-files,' of psychic charlatans and New Age airheads, of fatcat astrologers giggling all the way to the millennium." I met him only once, so my feeling of desolation and loss at his death is based entirely on his writings. Carl Sagan was one of the great literary stylists of our age, and he did it by giving proper weight to the poetry of science. It is hard to think of anyone whom our planet can so ill afford to lose.

Richard Dawkins is the Charles Simonyi Professor of the Public Understanding of Science at Oxford University. His latest book is Climbing Mount Improbable *(W. W. Norton, New York).*

Arthur C. Clarke

I was very sad to hear of Carl's untimely death. Though I was aware of his medical problems, recent reports had indicated that he was making a steady recovery.

My friendship with Carl, who in Japan

would be regarded as a national treasure, began more than thirty years ago: for my account of our adventure at the 1964 New York World's Fair, see Roddy McDowall's *Double Exposure, Take Three: A Gallery of the Celebrated with Commentary by the Equally Celebrated* (William Morrow, 1992).

Carl was a superstar in that difficult art where many otherwise capable and brilliant scientists are miserable failures: popular science communication. The book and TV series *Cosmos* still remain one of the most widely distributed and admired efforts to interpret the momentous findings and achievements of the space age.

In his later books, such as *Pale Blue Dot* and *The Demon-Haunted World,* he took on—ably and daringly—the pseudoscience and nonscience that rots the American mind, ranging from creationism and alien abductions to beliefs in astrology. At a time when *The X-Files* and its clones dominate the airwaves, Carl's loss is doubly tragic.

I ended my tribute to Carl in *Double Exposure* by recalling a more recent encounter I had via satellite with him and Stephen Hawking: "After a quarter of a century, Carl hasn't mellowed much. I'm sure he'd still be happy to give God a little helpful advice on how the universe *ought* to be designed."

I only wish I could believe that he's doing this right now.

Arthur C. Clarke's science fiction novels and stories and his nonfiction writing on space technology and the future have been influencing audiences and policymakers worldwide for half a century.

Martin Gardner

Carl Sagan was one of those rare working scientists who was also a superb science writer and who believed it was his duty to enlighten the general public about the wonders of the universe and of life on one of its smallest planets. I recall a time when he delivered a paper at a meeting of the American Association for the Advancement of Science denouncing Velikovsky as an ignoramus. He was roundly criticized by his colleagues. They said he had demeaned his reputation as a serious astronomer by wasting time on so frivolous a matter.

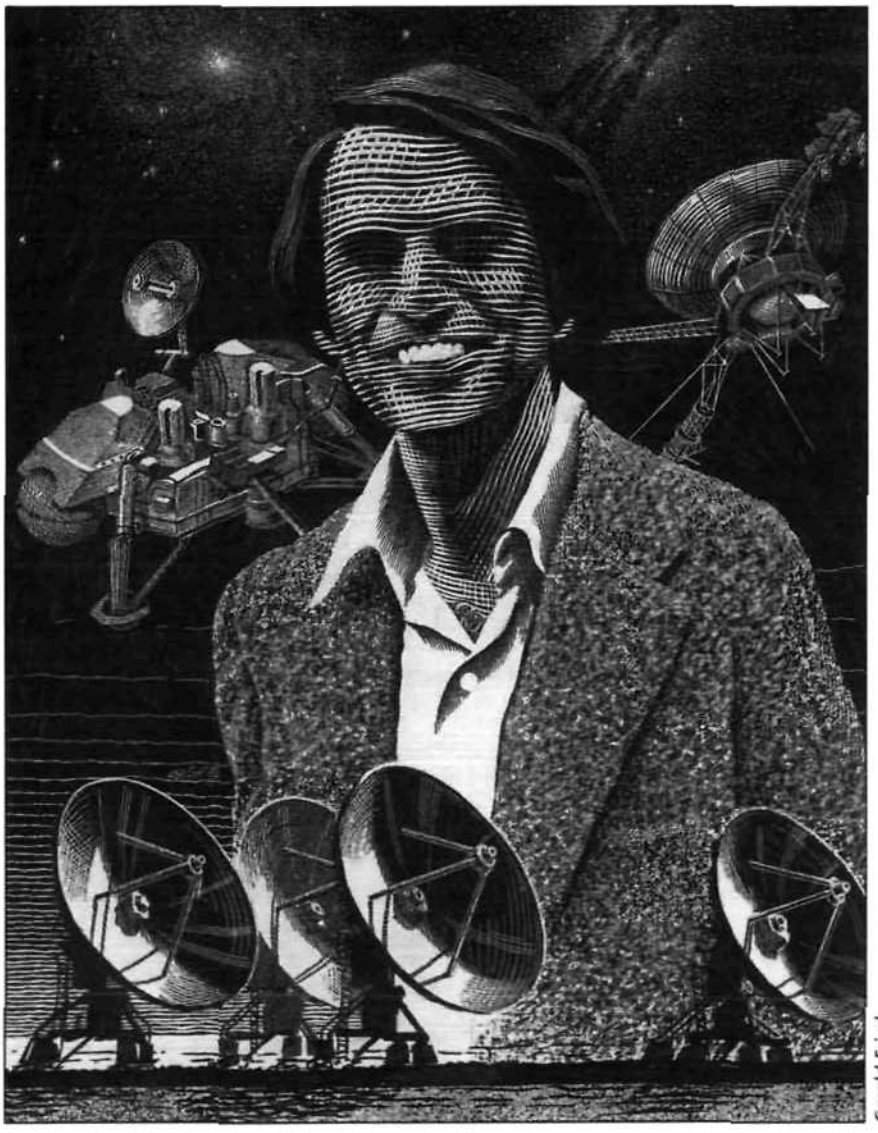
Now that irrational beliefs are more prevalent than ever, scientists are finally beginning to understand what Sagan tried to tell them. They have a responsibility to combat the increasing flood of bogus science in bookstores and on magazine stands, on movie and television screens, and even in courses offered by top universities. Carl's last book, *The Demon-Haunted World*, is a brave and powerful indictment of America's dumbing down, a vigorous plea for better science education. Carl, R.I.P. You fought a great fight and left the world healthier and wiser than it would have been without you.

Martin Gardner's latest books are The Night Is Large: Collected Essays 1938–1995, *and* Weird Water and Fuzzy Logic: More Notes of a Fringe-Watcher.

David Morrison

Carl Sagan did more than any other individual in this century to bring science to the public in a way that was consistently honest, thoughtful, and humane. Carl was a natural teacher, always ready to explain and defend his ideas. I never saw him asked a question that he was not willing to answer in a serious, thoughtful way, and I never saw him face a question that he had not already considered. He believed that everyone could understand science and should be interested in it. His faith in the power of human thought did not falter, even in the face of massive misinformation and unreason.

Carl was immensely influential in guiding public opinion on science, especially



Gerald Fried

on planetary exploration. He participated in and chronicled the history of the space age, thoughtfully considering the issues of why we explore and how we can use our knowledge of the planets, and of the balance between robotic and human exploration strategies. Carl often pointed out that ours is the only generation to experience the transformation of the planets from mere specks of light into real worlds, each with its own unique geology, atmosphere, and even potential for life. When he was a young assistant professor his popular public lectures at Harvard College Observatory were entitled "Planets are Places," a commonplace idea now, but a step of imagination then. His final book on space science, *The Pale Blue Dot*, summarized the exploration of eight planets and more than fifty moons, placing our own blue Earth in its cosmic perspective. He will be remembered best as the person who interpreted this generation of exploration for the public, and who helped create a new way to think about our own planet.

Carl's final book, *The Demon-Haunted World*, was a passionate defense of scientific skepticism and an attack on pseudoscience. The fact that this book was considered controversial and received less acclaim than many of his expository writings about science demonstrates how badly such works are needed. Understanding the nature of science and the way scientists view the world is more difficult for most people than absorbing and appreciating the facts of science. I fear that we will miss Carl's presence in this area more than any other. His uncompromising integrity and the respect with which the public viewed him were bulwarks against the tides of unreason. Let us use Carl's memory as a weapon in the struggle against pseudoscience, recalling the way he worked out problems as well as the eloquence with which he articulated the discoveries of science.

David Morrison, Director of Space at NASA Ames Research Center, was one of Sagan's first graduate students.

James Randi

Another of my giants has fallen. When Dick Feynman died in 1988, it was a terrible blow. In 1992, Isaac Asimov left us, and I was devastated. Now that Carl Sagan is gone, I feel even more deserted by my very limited spectrum of heroes. I feel anger and sorrow equally. Every four years, it seems I lose a valuable part of my existence.

My first meeting with Carl was when we lunched in New York City and he gave me his candid opinion of my first book, *The Magic of Uri Geller*. He found it, he said, rather poorly organized and lacking in documentation. I had to agree that he spoke sooth, and explained that I'd bashed it together within six weeks as a rush job for the publisher. It was felt that Geller's career was pretty well over, only two years after he first appeared on the scene, because the public would soon tire of the novelty. Therefore, my book was expected to have a very short life. Carl and I had many opportunities after that to recall just how wrong we'd been, in both those respects. But he provided me with a powerful comment on the book.

Carl was one hell of a speaker. Audiences always reacted positively to his message, and he handled questions—even very belligerent ones—with calm and incisiveness. I always envied his control in the face of idiocy and his patience with the uninformed.

As a teacher, he constantly instructed his students to "look into it" and "find out," rather than merely telling them solutions. I observed him with awe as he worked at Cornell when I was privileged to be consulted about the design of his Critical Thinking course. His constant good humor, sincere smile, and very expressive hands and face, all made him a fine teacher and public speaker, a convincing explainer of the beauty and importance of science.

Carl was a trifle annoyed that he had been credited with saying, "Billllyuns and billllyuns of stars!" He claimed that he'd never uttered the words, and that Johnny Carson had first used them in a parody of him. Carl's extensive exposure on the Carson show and his electric presence made him into one of the highest-paid lecturers on the circuit, and literally a household word. In my extensive travels, I've always earned jealous admiration from my association with Carl and with Martin Gardner. One Swiss scientist told me, "I'd kill just to meet either of them!" He hyperbolized only a bit, I'm sure.

I once discussed the *Cosmos* series with Carl, and with a mighty sigh he told me he'd had no idea of what the director and editors of the material intended to do with the many shots of him staring off at far horizons while shielding his eyes with his hand to his brow. "One more shot of me standing in a cardboard spaceship and musing over the future," he growled, "and I'd have had a minor fit of artistic revolt!" Even with the several minor failings of the series—all of editing and direction—*Cosmos* was by far one of the most effective vehicles of the time for bringing science to public. I know of many persons who were first made aware of the true nature of science by watching and enjoying *Cosmos*.

In *The Demon-Haunted World* Carl expresses, in one of the most moving and compelling selections from his work, his deep concern over the increasing tempta-

Carl Sagan at the 1994 CSICOP conference in Seattle, with Paul Kurtz (left), chairman of CSICOP, and Kendrick Frazier (center), editor of SKEPTICAL INQUIRER. Photo: Thomas Flynn.

tion of pseudoscience, superstition, and unreason, especially as the new millennium approaches: "Whenever our ethnic or national prejudices are aroused, in times of scarcity, during challenges to national self-esteem or nerve, when we agonize about our diminished cosmic place and purpose, or when fanaticism is bubbling up around *us—then, habits of thought familiar from* ages past reach for the controls." When these take over, "The candle flame gutters. Its little pool of light trembles. Darkness gathers. The demons begin to stir."

Well, dammit, one of those candles has gone out. The burden now falls on us to provide as much light as we can generate, to banish the darkness and make sure it does not triumph over us. If you ever doubt that your voice is needed to bring a little rationalism or truth to others who may need it, re-read these words of Carl Sagan. The demons must not be permitted to rise. We owe that much to the memory of this fine man.

James Randi, conjuror and investigator of psychic claimants, is author of Flim-Flam! *and* An Encyclopedia of Claims, Frauds, and Hoaxes of the Occult and Supernatural.

Jill Tarter

All of us working on the search for extraterrestrial intelligence (SETI) owe a special debt of gratitude to Carl Sagan; sadly, we can no longer look forward to repaying that debt in person. The best possible form of repayment would have been to present the extraordinary evidence required to support the extraordinary claim that we share our universe with other intelligent creatures from worlds beyond Earth. Such evidence still eludes us. Its discovery (we hope) lies in the future, and Carl Sagan, the man, now lies in the past. But Carl Sagan, the ultimate skeptic, will go forward into the future. Each student he taught, each colleague he worked with and challenged, each person who has read his final book, *The Demon-Haunted World*, will have experienced firsthand the best possible example of what it means to embrace the scientific method. To the extent that they follow this example and pass it along to their students and colleagues, they insure that Carl's passion for science and his message about the difference between evidence and belief will go forward into the future, to the benefit of all.

Jill Tarter is director of the SETI Institute's privately funded Project Phoenix in Mountain View, California, and a CSICOP fellow.

Paul Kurtz

Carl Sagan was not only a good friend, but one of the strongest proponents of CSICOP on the national and international scene. A charter fellow of CSICOP, Carl was ever willing to criticize claims of the paranormal.

I can attest to his personal courage and independence. In 1975, I organized a protest among scientists—the first of its kind—to the widespread growth of astrology and issued a statement, "Objections to Astrology," co-authored by Harvard astronomer Bart Bok and science writer Lawrence Jerome, and endorsed by 186 leading scientists from the National Academy of Sciences, including 19 Nobel Prize winners. Carl declined to sign it, because of its tone. Although a strong critic of astrology, he thought the statement would be ineffective. The next year, however, when we founded CSICOP, he accepted my invitation to become a fellow and joined with enthusiasm.

The following year I invited him to respond to an article by Immanuel Velikovsky in a special issue of *The Humanist* I was editing on the topic "Controversies on the Borderline of Science." His article, titled "Analysis of Worlds in Collision," sharply criticized Velikovsky. I remember how angry Velikovsky became with me for giving space to Sagan. For years Carl had been receiving vituperative attacks from the cult of Velikovsky; they had never forgiven him for his criticism of Velikovsky at an AAAS meeting in 1974. But Carl never wavered in his readiness to attack junk science and paranormal claims.

Carl volunteered his services to CSICOP time and again. He was the keynote speaker at two of our national conferences—in Pasadena in 1987 and Seattle in 1994—and we bestowed our In Praise of Reason and Isaac Asimov awards on him. And he took every occasion that arose to defend skepticism as essential to the process of scientific inquiry. One article he wrote for *Parade* magazine that extolled CSICOP brought in thousands of new subscribers. In his personal correspondence and meetings with me, he was effusive in his praise, but he was also ready and able to offer constructive criticism of us and make suggestions about topics that we *should investigate. He always insisted that* we be fair and impartial in our analyses.

At his sixtieth birthday celebration in 1994, which Barry Karr, executive director of CSICOP, and I attended, Carl again criticized pseudoscience and defended constructive skepticism. Although Carl Sagan was a resolute proponent of the scientific outlook and scientific methodology throughout his life, he was open to creative new theories on the frontiers of science; but he insisted that these be corroborated by the evidence. For example, although he argued that the search for extraterrestrial life is a great adventure for the human spirit, he was skeptical of those who proclaimed that UFOs were from outer space.

In the last months and weeks before his death, he hoped that the latest therapies of medical science might stem his illness and save his life. Alas, he did not survive. His death is a profound loss to CSICOP and the entire skeptical movement.

Paul Kurtz is founder and chairman of the Committee for the Scientific Investigation of Claims of the Paranormal.

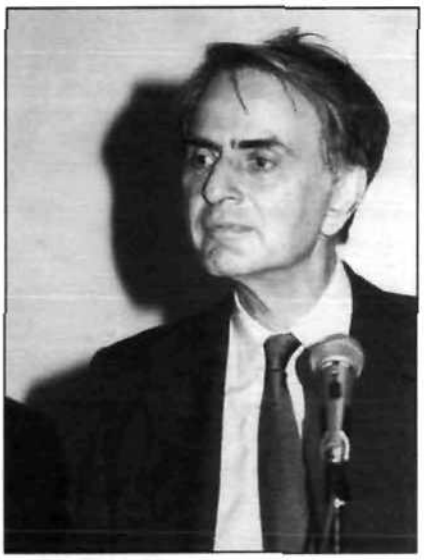


Photo: Thomas Flynn.

SAGAN TRIBUTE continued on page 12

Fund for the Future

CSICOP AT THE CENTER FOR INQUIRY

An Unprecedented $20 Million Drive for the

Human beings have never understood the material universe as thoroughly as they do today. Yet never has popular hunger for superstition, pseudoscience, and the paranormal been so acute.

CSICOP and the *Skeptical Inquirer* are leading advocates for skepticism nationally and worldwide. But so much more must be done in the years to come.

Day and night, the Center for Inquiry has become a focus of academic and popular inquiry.

Publishing revenues alone cannot fund the bold outreach today's challenges demand. Hence the Fund for the Future Campaign, a ten-year effort to add 20 million dollars to the Center for Inquiry endowments.* Gifts and endowment income will fund projects including:

Council for Media Integrity

Formed just weeks after its inclusion in the Ten-Year Plan, the Council for Media Integrity will monitor and rebut media programs that convey unfounded claims and mislead the public about science. Members include Steve Allen (chair), Carl Sagan, Stephen Jay Gould, and many others. CSICOP will invest in electronic infrastructure to facilitate rapid response to irresponsible programs.

Adult Education

The Council cosponsors the Center for Inquiry Institute, which has already expanded its offerings to include a new three-year certificate program in science and skepticism. Sessions are scheduled in Amherst and Los Angeles.

Enhancing Library Resources

The Center for Inquiry's skeptics' library—already the finest of its kind in the world—needs expanded funding to enlarge its core collection and add electronic media. Worldwide modem access to the library's catalog is already nearly complete.

*Combined endowment goal of CSICOP and the Council for Secular Humanism, both nonprofit tax-exempt educational organizations.

Steve Allen
Honorary Co-chair

Martin Gardner
Honorary Co-chair

uture of Science and Reason

The New Ten-Year Plan

To continue its leadership in the defense of reason, CSICOP has articulated a Ten-Year Plan designed to:

- *Promote science and reason*
- *Develop public support and participation*
- *Develop The Center for Inquiry as an education and research center*
- *Build up the Committee's resources*

The Center for Inquiry attracts global media attention with scholarly conferences and events like this public "Friday the 13th Superstition Bash."

For the Young

To present skeptics' message more compellingly to the young, CSICOP will develop new materials—ranging from age-appropriate print publications to audio and video cassettes and instructional courseware. Goals include enhanced understanding of science and improved critical thinking skills.

Regional Outreach

With the establishment of The Center for Inquiry - West (Los Angeles), The Center for Inquiry - Midwest (Kansas City) and The Center for Inquiry - Rockies (Boulder, Colorado), giant steps have been taken to enhance direct field service to skeptical activists. Additional regional Centers are planned with expanded calendars of activities.

How Can I Help?

The Center for Inquiry Fund for the Future depends on generous support from each of our readers and friends. Gifts of cash, securities, and other assets are sought. A three-year pledge can make more substantial gifts surprisingly affordable. Many forms of planned giving arrangements can be arranged. All requests will be held in confidence.

Only financial support from skeptics and other friends of science can place the skeptical movement on a firm financial foundation.

At the first World Skeptics Congress in Amherst, New York, participants gave or pledged an unprecedented $201,000 to give the Fund for the Future campaign a vigorous start.

We invite you to make your commitment to the Fund for the Future today. For more information, complete and mail the postpaid reply card.

CSICOP
at the
Center for Inquiry
P.O. Box 703
Amherst, NY 14226-0703

(716) 636-1425
FAX (716) 636-1733

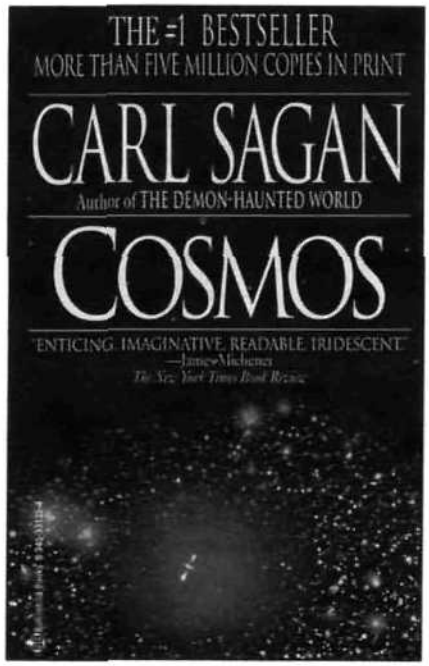
Alan Hale

I first met Carl Sagan at a DPS (Division of Planetary Sciences/American Astronomical Society) meeting during the late 1980s, when I stopped him after he'd given a paper and asked if he could stand to meet one more graduate student "who had always wanted to meet Carl Sagan." Despite the fact that he was on his way to an impending engagement, he took a few moments of his time to discuss some details of his paper with me. Since that time I had the privilege of meeting and chatting with Dr. Sagan at other conferences, and while the moments I had with him were usually quite brief, they are moments I treasure.

Carl Sagan's tireless and dedicated work toward answering some of the most basic questions as to who and what we are served as a significant inspiration to me to take up the search myself and make my own contributions toward understanding these questions. Through his work on the Viking and Voyager missions, and his efforts to understand the formation of solar systems and the very origins of life itself, he has helped enormously in unraveling the mysteries of the universe around us. We have all benefited from the humbling, yet awe-inspiring, view of the universe his work has helped reveal to us.

All his scientific achievements notwithstanding, I believe Dr. Sagan's most important contribution lies in his dedication to sharing that view of the universe with the lay public of our society. In a world awash in scientific illiteracy and pseudoscientific nonsense, his was a solid and unmistakable voice of science and reason. As we enter the twenty-first century facing a host of scientific and technological challenges that we are only now beginning to fathom, his was a voice that we could ill-afford to lose. It is incumbent upon those of us who remain to carry on the torch of reason, and to bring about the vision of the future that Carl Sagan instilled in the minds of those who so admired him.

Alan Hale is co-discoverer of Comet Hale-Bopp and is director of the Southwest Institute for Space Research in Cloudcroft, New Mexico.



Christopher Chyba

Everywhere in the universe Carl Sagan looked, he saw possibilities for life. But consider several of Carl's most important contributions to planetary science. At the outset of his career, he demonstrated that a runaway greenhouse effect would raise Venus' temperatures to hundreds of degrees above the boiling point of water—making life (as we know it) nearly impossible there. He later went on to show that the seasonal color changes on Mars that had been observed from Earth were probably due to global dust storms, rather than (as had been previously proposed) an expanding and receding seasonal wave of vegetation. Finally, in later research, he discovered the "early faint-Sun paradox," demonstrating that, assuming our own Sun had evolved like a typical G-class star, it would have been substantially fainter at the time of the origin of life on Earth, so the early Earth would have been much colder. Without a higher greenhouse effect on early Earth, or some other mechanism, surface temperatures would have been too cold for liquid water to exist, and therefore inhospitable for life. A similar problem would have existed for early Mars.

Each of these discoveries shares one characteristic: It makes life or the origin of life in our own solar system seem significantly less likely than would otherwise have been the case. These results obviously flew in the face of Carl's well-known enthusiasm for the possibility of extraterrestrial life. But they were the conclusions to which the data and his research led him. Again and again as a scientist, he followed his own admonition to be especially skeptical when one's deepest hopes or fondest wishes were at stake.

Christopher F. Chyba received his Ph.D. under Carl Sagan at Cornell University. He is now an assistant professor of planetary science at the University of Arizona.

Leon M. Lederman

I can think of no major problem influencing humanity, in personal lives, in communities, the nation, and the planet, that is not, in some deep way, influenced by our scientific age and which cannot be illuminated by a grasp of science—science as a way of thinking, science as a clarifier of issues. Carl Sagan understood this and used his great talents as an erudite and vibrant communicator. He set an awesome example for all of us. Scientists must embed communication as an essential part of their métier. The greater the scientist, the more important is this ethic.

By his own passion for planetary science, by his active concerns in national science policy, and by his unique and heroic efforts in public understanding, Carl Sagan has set new standards for the conduct of scientists.

We need a Carl Sagan Award for Public Understanding of Science. Friends of Carl, industry, and concerned citizenry should be able to assemble the endowment for a substantial annual award to call attention to and fan the flame that Carl Sagan kindled.

Leon M. Lederman is director emeritus of the Fermi National Accelerator Laboratory and a 1988 Nobel laureate in physics.

Clifford A. Pickover

I mourn the passing of Carl Sagan with great sadness. Sagan helped us understand the universe both through his television series *Cosmos* and his many publications describing worlds beyond our own as well as the worlds within ourselves. As I grew up, Carl Sagan was an inspiration, and now that my own popular science books are taking off, I feel an emptiness that I

can't share new projects with him. Strangely, just today I received galley proofs of my book *The Alien IQ Test* in which I had a humorous chapter devoted to the abduction of Carl Sagan by aliens. Sadly, the humor now seems misplaced, and I've asked Basic Books to remove the reference to Dr. Sagan before the book's publication this spring.

These days perhaps one measure of a science-popularizer's greatness is the number of wonderful web pages devoted to him or her on the World Wide Web. There are thousands of sites mentioning Carl Sagan or discussing his ideas. These sites, along with his books, will continue to reverberate long after his death. (I have gathered together links to some these thought-provoking Sagan sites on my home page at http://sprott.physics.wisc.edu/pickover/home.htm.)

We are all molded and remolded by those who have inspired us, and though their lives may pass, we remain, nonetheless, the products of their influence. No one as fascinating as Sagan can ever cross the path of our destiny without leaving some mark upon it forever.

Clifford A. Pickover, of the IBM Watson Research Center, is the author of a dozen popular science books including Black Holes: A Traveler's Guide *and* Keys to Infinity.

John Allen Paulos

Carl Sagan and I corresponded a few times in recent years, and his death prompted me to reread his letters. In one written just after a *Washington Post* article had discussed the snideness sometimes directed toward scientific popularizers, he asked about my experiences with the phenomenon. With characteristic simplicity he wondered, "I'm interested in understanding this very peculiar sense that these subjects (science and mathematics) are to be kept for an elite." Sagan reached expansively beyond the elite. Through his pioneering and exuberant efforts, a whole generation has glimpsed some of the power and beauty of scientific ideas and become wary of the ubiquitous quackery that too many scientists leave uncontested for fear of being labeled a popularizer. This fear is based on a confusion. The opposite of a popularizer is not an eminent researcher (which, of course, Sagan also was) but an unpopularizer (a common breed of scientist, unfortunately). Carl Sagan will be missed by many of us, and retroactively perhaps, if there are sentient beings elsewhere, by many others as well.

John Allen Paulos is a CSICOP fellow and the author of Innumeracy *and* A Mathematician Reads the Newspaper.

Chip Denman

I was an undergraduate at Cornell, where Sagan taught. Even in the mid-70s, Sagan was widely known to the public as an eloquent advocate of science and reason. Even before *Cosmos*, he was recognized from his appearances on the *Tonight Show* with Johnny Carson, an avid amateur astronomer. And Sagan was also regarded as one of the best teachers on campus. I regret that I did not take his ASTRO 101; my friends who did enjoyed it and him a great deal.

At one time I considered pursuing astronomy as a field of study. Our undergraduate astronomy club held a meeting in which Sagan came to talk about how best to prepare for a career in astronomy. There were no more than twenty of us in a generic classroom. Sagan draped himself across the desk at the front of the room and just chatted casually. His advice: don't take undergraduate astronomy courses—those were mainly meant for dabblers, to please the masses. Instead, he urged, study math and physics, the essential tools for serious astronomy. So I did, as a double major. I eventually realized that I was enjoying the math more than the physics, and so, one course short of the physics requirement, I dropped physics and doubled up on the math. I filled the hole in my schedule with courses in probability and statistics—and almost at once I found that this was the focus I had been searching for.

So, I did not become an astronomer. But Sagan's friendly advice to this young undergraduate indirectly brought me to my chosen field of mathematical statistics. I owe him much for that.

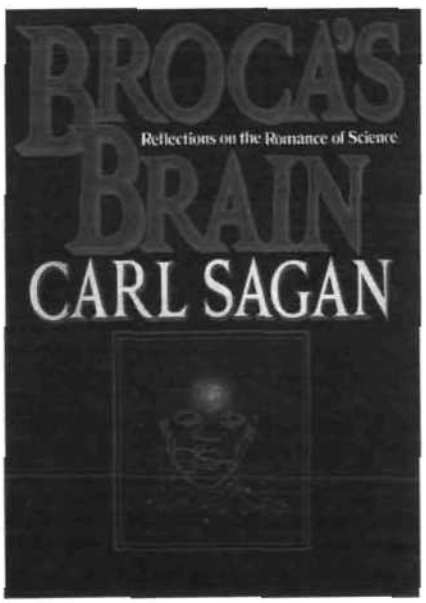
Others sometimes criticized Sagan for being a "popularizer"—as if that were a bad thing! I wish science had more who were even half as effective. As I became publicly active in the promotion of science and skeptical thinking, Sagan continued to inspire. Shortly after the founding of the National Capital Area Skeptics in 1987, I attended my first national conference sponsored by CSICOP. Sagan was the keynote speaker. His words were full of urgency, tempered with humor. I have found myself reaching back and quoting him when I've needed a nugget of skeptical thought that would make sense to a reporter or an audience. Few had his ability to make skepticism sound so sensible, natural, and necessary.

The public no longer has him to reach out to them from their Sunday papers, where few scientists dare to tread, and to thrill them with the excitement of good science and good thinking. I am sad for that.

Chip Denman is manager of the Statistics Laboratory at the University of Maryland, where he also teaches "Science and Pseudoscience" for the University Honors Program. He is past-president of the National Capital Area Skeptics.

Shawn Carlson

I didn't know Carl Sagan personally, but like many of his admirers, I sullenly followed the progress of his terrible illness. After seeing his last appearance on the news show *Nightline*, when he was physically weak and displaying the devastating effects of chemotherapy, I guessed that the

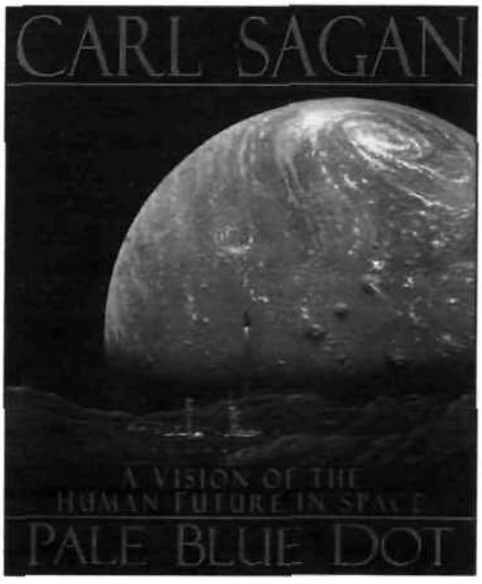


end would come soon. And yet when the sad news of his death did arrive a few weeks later, it moved me far more than I ever thought it would.

We all know of Sagan's accomplishments as a researcher and of his unparalleled stature as the "showman of science" (to quote *Time* magazine). But if historians mark only these, they will be selling his legacy far short. The ultimate measure of a great life lived is the impact one has had on other lives. And by this accounting, Carl Sagan was a great man indeed. His life and works will ultimately contribute to far more good in the world than even he could have known.

I was still an undergraduate when *Cosmos*, perhaps Sagan's greatest masterpiece, first aired. It was quite unlike any documentary I had ever seen. Sagan's passion for science shined through. And his eloquence at translating scientifically obtuse concepts for the masses was, for me, inspirational. I loved it! Indeed, *Cosmos* helped inspire me to become a science writer. As I see it, every column I write for *Scientific American* propagates a little more of Sagan's influence.

I'm confident that dozens of other science writers were equally inspired, and for all of their work Sagan deserves a little credit. Further, there must be hundreds of working scientists whose passion for science was sparked, or at least helped along, by Sagan's zeal. And with hundreds of millions of viewers worldwide, Sagan's *Cosmos* advanced science literacy tremendously. Indeed, if Clarence (the sprightly angel from *It's a Wonderful Life*) could show us what the world would have been like had Carl Sagan never been born, I'm quite sure we would find it a markedly poorer place; less literate with far fewer eyes turned skyward.



Shawn Carlson writes "The Amateur Scientist" department for Scientific American *magazine and is the founder and executive director of the Society for Amateur Scientists.*

Nicholas Humphrey

I think of Carl Sagan in the summer of 1987 at the Moscow conference of the International Physicians for the Prevention of Nuclear War. He spoke out with his matchless combination of authority and passion against the self-perpetuating absurdities of the Cold War, the folly of the arms race, and the irrationality of the policy of nuclear deterrence. He had been doing some sums: by his calculation, the total defense expenditure by the United States since the end of World War II would by now be enough to buy up every saleable object on the North American continent—every building, every work of art, every TV set, every automobile, every silk stocking, and every stand of timber. Meanwhile half the world was starving. Sagan's quiet anger at the situation he described, and his own determination to use all his powers to change it, spread to everyone in his large audience—and perhaps it also spread beyond. Gorbachev received a delegation from the conference that same day and listened thoughtfully as they pressed for the Soviet Union to take the initiative toward disarmament. Within a few months the process had begun. Sagan was a model of the socially responsible scientist. He loved truth, beauty, and life, whether at the level of science or public policy, and hated superstition, narrow-mindedness, and false prophecy. He was one of those rare people capable not only of interpreting the world but of changing it: and he did both.

Nicholas Humphrey, author of Consciousness Regained: A History of the Mind *and* Soul Searching, *is a professor of psychology at the New School for Social Research, New York.*

Daniel R. Alonso

I am a federal prosecutor. I also was a student of Carl Sagan's at Cornell in the fall of 1986. Just last week, a friend and I were discussing which living American we admired most. Without hesitation, I named Carl Sagan, which might have struck my friend as odd. After all, it's not often that a lawyer reserves his greatest admiration for a scientist.

To me, it made perfect sense. As a federal prosecutor, I am very much in the business of skepticism. It's my job not to take things at face value, but instead to investigate in a logical and thorough manner, hoping to arrive finally at the truth. It also made sense because I was fortunate to have known briefly the man I admired so much, as I was his student. The skills Carl Sagan taught me—both personally and through his writings—have served me well in my chosen profession.

In the fall of 1986, I told Professor Sagan that I wanted to be a prosecutor and asked him to recommend me for law school. He graciously agreed, but not before dissecting my intended career choice in ten different ways and ruminating about it for a while. As those who knew him much better than I did surely know, this was his usual way, and it had its intended effect in this case of really making me think about where I was headed.

In my work today, I do quite a bit of dissecting and ruminating of my own. Thinking about Professor Sagan ten years later, I'm pleased that he was there to share my career choice with me and impart me with skills I needed to succeed. Now, as I continue down my own path, I think fondly of my Cornell professor, who was taken from us all—lawyers, scientists, and many others—long before his time.

Daniel R. Alonso is an assistant United States attorney in New York City.

Javier E. Armentia

I remember, in 1980, that man on the screen, waving his hands, explaining astronomy as no one before had done on TV. I was studying physics, and he convinced me to become an astronomer. So he did for many of my colleagues and many of

my students. Later I discovered the writer, the skeptic, the scientist . . . and he again convinced me of many things. No doubt we will miss Carl Sagan. But I know that his work and his life have been of great influence to many people: we, those who must continue working to popularize science, skepticism, and critical thinking.

Javier E. Armentia is president of Alternativa Racional a las Pseudociencias (ARP) and director of Planetario de Pamplona, Pamplona, Spain.

Barry Williams

Australian Skeptics

I am sure that all Australian skeptics and all who experienced the feelings of wonder and love of science that he inspired will feel deeply the loss of Carl Sagan. He was truly a frontline warrior in the battle against ignorance, superstition, and the "armies of the night." He was far too young to have left the scene and, although I never had the pleasure of meeting him, I will miss him.

Swedish Skeptics

Carl Sagan's books have had a major impact in Sweden, both through translations and in the original English. There are few other writers of popular science who have reached as many enthusiastic readers in our country. To us in the Swedish Skeptics, his writings have been a constant source of inspiration. And they will continue to be so, for Carl Sagan was a man whose influence will last much longer than his own life.

For the board of the Swedish Skeptics, Per-Olof Hulth (chairman) and Sven Ove Hansson.

Michael D. Sofka

I had the great pleasure of hearing Carl Sagan speak in 1994 at the State University of New York at Albany. This was just before the publication of *Pale Blue Dot*, and his talk included a short reading from that book about the Voyager photograph of Earth. In this photograph, taken at Sagan's insistence, Earth was a single pixel—a pale blue dot. "On [that dot] everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives. . . . The Earth is a very small stage in a vast cosmic arena. Think of the rivers of blood spilled by all those generals and emperors so that, in glory and triumph, they could become the momentary masters of a fraction of a dot." Carl Sagan saw the big picture.

More important, Carl Sagan was passionate about bringing the big picture to others. He was above all else a teacher, and I think an extraordinary one. After his talk, he sat down and for nearly an hour took questions from the audience. People lined up at the microphone to ask him about life on other planets, UFOs, the nature of science, and his views on religion. I sat there in awe.

Sagan looked perfectly at ease, in his natural environment, while answering those questions. And what questions they were! Many of them would have left me, and I suspect most readers, exasperated.

In *The Demon-Haunted World* Sagan *said there is no such thing as a dumb question.* He really believed this. Never did he show a lack of patience. Never once did he answer in a way that would make the questioner feel silly. He used each question to teach something. He might say that he didn't know the answer, "but, let me tell you a related story," and he would proceed to use the question as a jumping point for something better. The questioner always seemed satisfied. We skeptics lost a friend. But more, we lost a teacher.

Mike Sofka is president and co-founder of the Inquiring Skeptics of Upper New York.

Mark Boslough

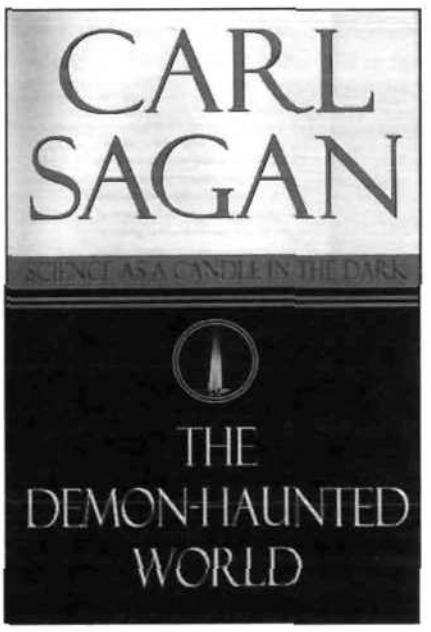
*One week before Carl Sagan's death I vis*ited a friend who is a professor at a large southwestern university. We stayed up late that night talking about our research and sharing our gripes about the lack of support for science and the decay of education standards. My friend pointed out that his university prioritizes athletics above all else. Unfortunately, he said, that's the sensible thing to do because such a large fraction of the applicants say that they are interested in the school because of its basketball team. He went on to tell me that when he was a post-doc at Cornell, many students there said they chose to apply because of Carl Sagan's presence. We laughed at the irrelevance of both of these reasons, but later I remembered that Cornell was one of the few graduate schools to which I applied twenty years ago, shortly after the Viking mission landed robots on Mars. Science may never surpass basketball in the hearts of most school administrators, but the fact that a scientist can serve as a university recruiting device should give us all hope.

Mark Boslough is a physicist at Sandia National Laboratories, specializing in large-scale impacts.

Colin Groves

Carl Sagan was a leading scientist and one of the world's foremost science communicators. His books and television programs were required fare for everyone interested in whatever branch of science. His successes in swaying doubters and waverers may relate both to his scientific rigor and to his deeply humane personality, which shone through his presentations and his writings. Scientists, educators, and skeptics everywhere will miss him greatly.

Colin Groves is in the Department of Archeology and Anthropology at Australian National University, Canberra, Australia.



Farrakhan, Cabala, Baha'i, and 19

The two greatest sacred books of world religions are the Bible and the Koran. Given the belief that God directed the writing of each, it is not hard to understand how the faithful could imagine that their divinely inspired text would contain hidden mathematical structures proving the book's supernatural origin.

With respect to the Old Testament, this kind of numerology reached its zenith among the Cabalists—Jewish mystics whose roots trace back to pre-Christian times but who flourished mainly in medieval and Renaissance centuries. They believed that letters of the Torah (the Old Testament's first five books) concealed thousands of secret meanings. These mysteries were extracted from the text by a process called *gematria*. A number was assigned to each Hebrew letter. These numbers were then added, multiplied, and manipulated in other ways to disclose subtle correlations and hidden meanings.

Similar techniques were widespread among Christian mystics. They assigned numbers to both Hebrew and Greek letters of the Bible. In recent years the most indefatigable Christian gematrist was the Russian mathematician Ivan Nikolayevich Panin, who died in Canada in 1942. His voluminous writings furnished what he believed was irrefutable proof that the Bible was written by the Almighty.

The most preposterous book of Christian gematria published in the United States this century was *Theomatics: God's Best-Kept Secret Revealed* (Stein and Day, 1972). It was written by Jerry Lucas, an All-American basketball star with the New York Knicks, and his fundamentalist friend Del Washburn. According to the dust jacket, their book "scientifically proves that a Mind, far beyond human capabilities . . . planned, constructed, and formed every word in the Bible." Their technique is an original form of absurd gematria. The naive authors seem totally unaware of the vast earlier literature along similar lines. (For details about this book, see my review in *Order and Surprise*, Prometheus Books, 1983.)[1]

Today's Christian fundamentalists have lost interest in gematria, but the practice still thrives among extremely orthodox Hebrew scholars. The latest development in this dismal field springs from the use of computers to analyze the Torah. In the 1980s three Israeli mathematicians, Doron Witztum, Eliyahu Rips, and Yoav Rosenberg, made an extensive search through the Torah, using a sophisticated computer program, for secret words and phrases. The words emerged when the computer checked every *n*th letter, where *n* can take any value. They were amazed to find the names of dozens of famous rabbis of later centuries. Future events were predicted. For example, in one sequence of letters they found the Hebrew words for *Sadat, president, shot, gunfire, murder,* and *parade*. They took this to be a prediction of Anwar Sadat's assassination in 1981. Even Norman Schwarzkopf's name turned up!

Media around the world gave all this widespread coverage in 1995 when they reported on an article by psychiatrist Jeffrey Satinover in the October issue of *Bible Review*. Titled "Divine Authorship?" the article discussed two papers by the Israeli mathematicians on what they call ELS (Equidistant Letter Sequences) in Genesis.

As a simple experiment, I considered only the first fifteen words in Lincoln's Gettysburg Address and checked every *n*th letter for *n* equal to 2 through 10—that is, letters separated by one through nine letters. I found thirty-two three-letter words and the following four-letter words: *sort, soar, Nero, huts, hoot,* and *NATO*. Imagine how many longer words would turn up in books as long as Genesis or a play by Shakespeare, and allowing *n* to vary from 2 through 100. In ancient Hebrew there are no vowels. This results in considerable vagueness over what word is intended. I could have

Martin Gardner's latest book is Weird Water and Fuzzy Logic: More Notes of a Fringe-Watcher *(Prometheus, 1996), a collection of sixteen of his most recent* SKEPTICAL INQUIRER *columns plus thirty reviews of books that deal with science, philosophy, theology, and the paranormal.*

found much longer words in the first fifteen letters of Lincoln's speech had I been allowed to insert vowels between consonants.

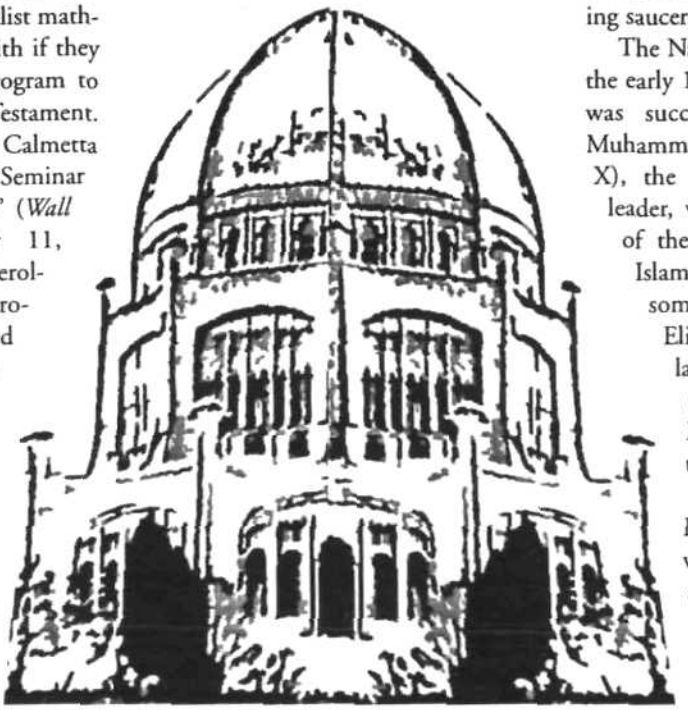
In their highly technical 1994 paper "Equidistant Letter Sequences in the Book of Genesis" (*Statistical Science* 9: 429–438), the Israeli mathematicians claim that they applied their program to a Hebrew translation of Tolstoy's *War and Peace*. Although they found plenty of words, they insist that nothing turned up comparable to the words and phrases they found in Genesis. Why Jehovah would go to such trouble to hide words in the Torah beats me. It strikes me as blasphemous to turn God into a whimsical dabbler in crude wordplay.

I know of no Catholics or liberal Protestants who take ELS numerology seriously, but American fundamentalists have latched onto it as proof that God wrote the Old Testament. On a television show of June 6, 1996, I heard Hal Lindsey defend with great enthusiasm the Israeli findings. Lindsey is the Protestant fundamentalist who has written a series of best-sellers about the soon emergence of the Antichrist and the coming of Jesus. Other fundamentalists around the world are now trumpeting the Israeli research. It would be interesting to know what fundamentalist mathematicians would come up with if they applied an ELS computer program to the Greek letters of the New Testament.

Wall Street Journal reporter Calmetta Coleman, in an article titled "Seminar Tries Science to Revive Faith" (*Wall Street Journal*, Novem-ber 11, 1996), reports that ELS numerology is now being heavily promoted by a Jerusalem-based organization called Aish HaTorah, founded by Rabbi Noah Weinberg. The organization runs a movement called Discovery that conducts hundreds of seminars in Jewish synagogues and schools around the United States—seminars designed to win secular Jews back to orthodoxy.

Readers may be surprised to learn that over the centuries Islamic fundamentalists have squandered equally incredible amounts of time and energy on numerology intended to prove that Allah, through the angel Gabriel, dictated the Koran to Muhammad. Americans got a brief glimpse of this number play when Louis Farrakhan spoke for two and a half hours to blacks who assembled in Washington, D.C., for the October 16, 1995, "Million Man March." Here is an excerpt from Farrakhan's speech:

> There in the middle of this mall is the Washington Monument, 555 feet high. But if we put a 1 in front of that 555 feet, we get 1555, the year that our first fathers landed on the shores of Jamestown, Virginia, as slaves.[2]
>
> In the background is the Jefferson and Lincoln Memorial. Each one of these monuments is 19 feet high. Abraham Lincoln, the 16th president, Thomas Jefferson, the 3rd president, and 16 and 3 make 19 again. What is so deep about this number 19? Why are we standing on the Capitol steps today? That number 19, when you have a 9, you have a womb that is pregnant, and when you have a 1 standing by the 9, it means that there's something secret that has to be unfolded. . . .



The Baha'i temple in Wilmette, Illinois, the first of seven similar temples around the world.

In *The Million Man March Home Study Guide Manual*, published by Farrakhan before the march, he included a map of the Capitol's Mall, on which lines connecting major buildings revealed a concealed pyramid. Minister Farrakhan is convinced that Washington, D.C., was carefully designed by Masons to symbolize the Great Pyramid of Egypt, the Sphinx, the Valley of Kings, and so on. He approves this because he believes that Masons were followers of Muhammad. Do not Shriners wear fezzes and mention Allah in their sacred rites? Farrakhan's *Home Study Guide* calls attention to the number of U.S. presidents who were Masons, or what he calls "Moslem Sons." (See Charles Freund's article "From Satan to Sphinx: The Masonic Mysteries of D.C.'s Map," *Washington Post*, November 5, 1995.)

On October 15, 1996, on Ted Koppel's *Nightline*, Farrakhan said that the earth has long been observed by higher beings in UFOs and that our government is concealing this from the public. An enormous flying saucer he called "Ezekiel's wheel" may soon appear in our skies. UFO-believers have long regarded the first chapter of Ezekiel as an ancient description of a gigantic flying saucer.

The Nation of Islam was founded in the early 1950s by Wallace D. Fard. He was succeeded by the late Elijah Muhammad. Malcolm Little (Malcolm X), the movement's most energetic leader, was assassinated by members of the movement. The Nation of Islam split in the late 1970s, with some of the faithful going to Elijah's son Wareth Deen, and a larger group taking Farrakhan (born in 1933 in the Bronx as Louis Eugene Walcott) as their leader.

I am not sure where Farrakhan got his fascination with 19, probably from Elijah and his followers. In the *Free Call*, a paranoid newspaper published by the Nation of Islam, Tynetta, one of Elijah's former wives, writes a column titled "Unveiling

the Number 19." It was Dr. Rashad Khalifa, whom we will meet in my next column, who introduced her to the wonders of 19 in the Koran. In addition to wild numerology, Tynetta is deep into Egyptian pyramidology and ufology. In Isaiah 19:19 she found a reference to an Egyptian "altar to the Lord," which she says is "about 19 feet high."

In a September 27, 1995, column, Tynetta told how Farrakhan, ten years earlier, was taken by a beam of light from the top of a Mexican pyramid to a small alien spacecraft. It then docked with a mother ship 1,500 times larger. There he heard the voice of Elijah Muhammad tell him that Ronald Reagan was planning to bomb Libya!

For many centuries Islamic mystics, especially the Sufis, regarded 19 as sacred, and in recent times the number has played a central role among the Baha'is. The Baha'i offshoot of Islam began in 1844. That was the year a young Persian merchant who took the name of Bab—the word signifies a gate to faith—declared himself to be, like John the Baptist, the herald of a great new "manifestation" of Allah. Because Islam does not recognize a prophet since Muhammad, Babism was bitterly denounced as a heresy. The Bab was imprisoned by the Persian government and, in 1856, was executed by a firing squad. Thousands of Babists were also murdered.

In 1863 another Persian, taking the name of Baha'u'llah (Glory of God), declared himself to be the very manifestation foretold by the Bab. His and the Bab's writings constitute the Baha'i scriptures. After nine months in prison, Baha'u'llah was allowed to spend the rest of his life near Haifa, now part of Israel. After he died in 1892, his eldest son took over the movement called Baha'i, meaning "the followers of Baha'u'llah."

The son's trip to the U.S. in 1912 so energized the nation's small group of Baha'is that the religion spread like wildfire. There are now said to be five million Baha'is around the world. The largest numbers are in Iran (formerly Persia), with more than 100,000 in the U.S., the largest group outside Iran. The movement is now growing most rapidly in Africa and India. You'd never guess what native state harbors the most Baha'is. It is not California, but South Carolina!

The main appeal of the Baha'i faith is its teaching that all religions contain basic truth, although the faithful must believe that the truth reached its purest form in the teachings of Baha'u'llah. After death, the soul leaves the body for endless progress in another realm of being, about which we can know nothing except that it is as different from our world as our world differs from our mother's womb.

Baha'i also stresses the equality of the sexes, the equality of races, and the harmony of religion and science. It sees humanity as slowly evolving toward a world-state free of wars and injustices, and speaking a world language. Among prominent Americans who became Baha'is are the singer and motion picture star Vic Damone, the artist Mark Toby, who died in 1976, and the late jazz trumpet player Dizzy Gillespie.

The Baha'i world headquarters are in Haifa, and its U.S. headquarters are in Wilmette, a northern suburb of Chicago. Wilmette is the site of a magnificent Baha'i temple. Six similar houses of worship have been built in other cities around the world. The religion has no clergy or rituals, although members are urged to pray daily, to fast nineteen days during Ala, the last month of the Baha'i year, and to make at least one pilgrimage to Haifa. Women are exempt from the fast period if they repeat "Glorified be God, the Lord of Splendour and Beauty" $5 \times 19 = 95$ times on each of the nineteen days.

Since their origin, the Baha'is have endured violent persecution by Islamic fanatics. This reached a terrible climax in the early 1980s when Shi'ite leaders under Khomeini tried to destroy Baha'ism in Iran. More than two hundred Baha'is were killed, hundreds more imprisoned. Thousands lost their homes and possessions. Mobs desecrated Baha'i halls, sacked their temples, cemeteries, and shrines. Baha'i schools and corporations were taken over. The House of Bab, a holy shrine, was demolished. The violence subsided after 1985, but Baha'i religious activities in Iran remain forbidden.

Baha'is are entranced by 9 and 19, both numbers having roots in Islamic tradition. Nine stands for the nine manifestations of the transcendent, wholly other, unknowable Allah. They are Moses, Buddha, Zoroaster, Confucius, Jesus, Muhammad, Krishna, the Bab, and Baha'u'llah. The Wilmette temple has nine sides, nine doors, nine pillars, nine arches, nine ribs in the dome, and nine fountains. At each entrance are $2 \times 9 = 18$ steps. Baha'i temples elsewhere have similar structures. A nine-pointed star is the most widely used symbol of Baha'i faith.

Nineteen, Islam's other sacred number, is mentioned in the twenty-fifth verse of the Koran's Sura 74, titled "The Hidden Secret." Anyone who denies that the Koran came from Allah, this chapter says, will suffer forever in hell under the supervision of nineteen angels. "What mystery doth God intend for this number?" another verse asks. The mystery and sacredness of 19 was constantly stressed by early Islamic mystics, from whom it passed into the teachings of the Bab, down to today's Baha'is and to Reverend Farrakhan.

FRINGE-WATCHER continued on page 57

Gardner Receives Forum Award

Martin Gardner has recently been awarded the Forum Award of the American Physical Society. It will be presented in Washington, D.C., in April. The citation for the award reads:

> For his popular columns and books on recreational mathematics which introduced generations of readers to the pleasures and uses of logical thinking; and for his columns and books which exposed pseudoscientific and antiscientific bunk and explained the scientific process to the general public.

For more information on the Forum Award, visit the American Physical Society web page at: www.aps.org; click on Forums, and click on the Forum on Physics and Society page.

—Marc Sher

Something to Cry About: The Case of the Weeping Icon

On September 3, 1996, at the request of the *Toronto Sun*, the Committee for the Scientific Investigation of Claims of the Paranormal dispatched me to Canada to investigate the world's latest "weeping icon." I was to meet with reporters at the newspaper's King Street offices and from there be escorted to a Greek Orthodox Church in Toronto's East York district. Church officials had promised the *Sun* they could examine the icon at 11 P.M., and I was enlisted for that purpose. In addition to my overnight bag, I also packed a "weeping icon kit" consisting of a camera and close-up lenses, a stereomicroscope removed from its base, and various vials, pipettes, bibulous paper, and other collection materials.

Investigator of paranormal phenomena Joe Nickell peers over the shoulder of embattled Greek Orthodox priest Ieronimos Katseas—once defrocked for working in an Athens brothel—as he illuminates a "weeping" icon of the Madonna. Photo: Craig Robertson, courtesy of the *Toronto Sun*.

As we arrived in the neighborhood, however, I saw not the nearly deserted church I had expected to be awaiting our special appointment but rather traffic congestion and a line of pilgrims stretching far off into the night. I waited outside with my conspicuous case while reporters went to learn that the promise of an examination had been retracted. I was determined to proceed anyway and do the best I could. A *Sun* reporter of Greek extraction feared I might start a riot, but his colleague, Scot Magnish, who had brought me there, was only concerned for my safety. (It was not wise for *him* to go inside, given rumored responses to his critical article on the phenomenon published in the latest edition of the newspaper.) After retrieving some essentials from my kit, which I stuffed into my pockets, I handed Scot my case, turned, and bounded up the steps of the little church two at a time. Behind me, *Sun* photographer Craig Robertson rushed to keep up. We passed a lady who shouted the admission price ("two dollars fifty cents") at us; I shouted back, "*Toronto Sun*!" and kept going.

Inside, the church was swelteringly hot. Nevertheless people milled about for a time after viewing the controversial icon of the Madonna and Child, while new pilgrims passed before it. A table filled with candles and a crude sign that read "PLEASE DO NOT TOUCH THE ICON OF VIRGIN MARY" kept the curious at bay. An attendant refused my request for a sample of the tears and pretended to ignore me when I asked again, in a louder voice.

A hanging oil lamp partially obscured the face of the Madonna, but by moving my head from side to side and thus catching the light on the surface of the picture, I made several important discoveries. First, the icon was a fake—not an

original wood-panel painting at all but merely a color photographic *print*. In addition, the "tears" did not emanate from the eyes but from somewhere near the top of the Virgin's head, and so, by definition, the image was not "weeping." Moreover, one of the four tear rivulets was smeared and looked "suspiciously oily" (as I told the *Sun*).

The latter point was quite significant since real tears, or even mere water, would quickly dry in the hot atmosphere of the church. But a nondrying oil (such as olive oil) would remain fresh and glistening for hours—just the trick for "weeping" icons and one apparently more commonly used than the hidden tubes and special chemicals so often proposed by theorists. During the quarter of an hour or so that I observed the image, there was no fresh flow of "tears"—just the same unchanging rivulets I saw at the beginning. (There were also fine droplets between the streaks as if the painting had been spattered on, possibly from the oil lamp that almost touched the print.)

After lengthy appeal, I persuaded the priest, Rev. Ieronimos Katseas, to provide a better view—at least for the photographer. Katseas pulled the lamp away with one hand while holding a candle close to the Madonna's face with the other. Photographer Robertson clicked away, producing the accompanying photograph.

In the subsequent article by Magnish and two colleagues, I was quoted as saying that the phenomenon was "more carnival sideshow than miracle" and that I was troubled by the withdrawal of the promise to allow the icon to be examined. "It would seem to me a miracle could withstand a little skepticism," I stated, complaining further about being kept at a distance and being refused a sample of the "tears" (Magnish et al. 1996).

In the meantime, reporters learned that Katseas had been embroiled in considerable earlier controversy. It turns out that he had also preached at a Greek Orthodox Cathedral in Queens, New York, when an icon there—that of a mid-nineteenth-century nun, St. Irene —began crying and drawing hundreds of thousands of pilgrims, some from as far away as India and Japan. More than a year later, after I had investigated that icon with the New York Area Skeptics and concluded that the phenomenon was bogus (Nickell 1993), the icon was stolen at gunpoint. Supposedly, Katseas refused to cooperate in producing the key to the case that housed it and was pistol-whipped, after which the bandits broke the lock and made off with the "miraculous" icon. It was subsequently returned—minus $800,000 in gems and golden jewelry that decorated it—under conditions that still remain controversial (Christopoulos 1996).

Katseas was also defrocked in 1993 when it was learned he had previously worked in a brothel in Athens. A church document on the priest's excommunication states that a New York ecclesiastical court found him guilty of slander, perjury, and defamation, as well as being "in the employ of a house of prostitution" (Goldhar 1996). In fact, in 1987, in sworn testimony before a Greek judge, Katseas admitted he had been so employed (Magnish et al. 1996).

A rumor I heard from neighborhood residents was soon confirmed by a newspaper report, namely that the Toronto icon began weeping after the East York church found itself financially strapped with an accumulated debt from mortgages of almost $271,000. In June, in response to the debt situation, the church dispatched Father Archimandrite Gregory from Colorado with instructions to evict Katseas from the church, but the matter became mired in the courts. After the icon began "weeping," Gregory cast doubt on the phenomenon, stating in a letter, "It would not be surprising if this were a hoax, in order to attract people to spend money" (Goldhar 1996). Such revelations and opinions, however, had no effect on some pilgrims. Said one woman: "I don't care if there's a pipe and a hose behind that picture. I don't care if the Virgin Mary jumps right out of the painting. You either believe in miracles or you don't. I believe" (DiManno 1996). On the other hand, a woman living in the neighborhood stated, "We all need something to believe in, but this is preying on those who really need a miracle" (Goldhar 1996).

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Season of the Supernatural

Perhaps it's because the end of the millennium is looming. Maybe it's the longing for a new enemy to replace the now-defunct Soviet Union. Or maybe Hollywood is simply trying to get on the bandwagon in the wake of the cultish success of *The X-Files*. But last fall marked the start of a deluge of all things supernatural.

The harbinger was the hit movie *Independence Day*, where extraordinarily powerful space aliens proved to be incredibly stupid when it came to encrypting their computer codes. In an era when ulcers are born trying to get one Earth computer to talk to another, it's nice to discover that extraterrestrials have resolved that nagging Macintosh-PC compatibility problem. It allowed us to take the spaceship recovered from Roswell, New Mexico, fly it into the alien mother ship, and hack our way to victory.

And things took off from there.

Fall brought us new episodes of the laughably self-serious series *Sightings*—a show that found a new home (appropriately enough) on the Sci-Fi Channel—and more enigmatic *X-Files* episodes.

But it also gave us a whole new wave of programs intent on tapping the *X-Files* audience.

The show that got the most hype was the Fox network's *Millennium*, developed by *X-Files* creator Chris Carter. Carter told me last June that skeptics upset about *The X-Files* would be even less pleased with *Millennium*. That may not be the case. Instead of lending some credibility to the supernatural, *Millennium* seemed to be closer to *Silence of the Lambs*, with fewer examples of supernatural powers and a greater focus on down-to-earth evil.

Millennium's premise is that humankind's "loony quotient" is rising rapidly because the millennium is looming, and an ex-FBI agent who specialized in tracking down bizarre serial killers has joined forces with a network of law enforcement officials, known as the Millennium Group, that is quietly trying to counter the madness.

Ex-agent Frank Black's talent was obvious in the first episode, when he walked up to a body bag and informed a Seattle detective that the victim had been decapitated and had her fingers cut off. The killer, Black eventually discovered, was trying to fulfill the prophecy in a Nostradamus quatrain.

Black's former colleague in the Seattle Police Department wanted to know how he does it.

"I see what the killer sees," he said.

"Like a psychic?" the cop asked.

"No," Black responded. "I put myself in his head."

Ally Walker plays NBC's psychic forensic psychologist Samantha Waters on *Profiler*. Photo: Gary Null ©NBC, Inc.

Pleeeease. Let me give you some advice, Frank. You're psychic. Deal with it.

NBC's *Profiler* is the other psychic detective show, where Ally Walker plays Samantha Waters, a beautiful forensic psychologist whose scientific skills are spiced with enough psychic ability to catch images of each crime.

Profiler and *Millennium* turned out to be strikingly similar in many respects.

Both Black and Waters get only limited flashes of psychic insight, both were

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Dark Skies cast members J.T. Walsh, Megan Ward, and Eric Close. Photo: Paul Drinkwater ©NBC, Inc.

forced into retirement for a time because of the horrors of their jobs, and neither can tap their psychic abilities to get clues about the sickos stalking their own lives. (Waters is the object of obsession for a serial killer murdering people from her past, including her husband. Black is haunted by someone who keeps sending him close-up Polaroid photographs of his wife taken surreptitiously in public places.)

The good news for skeptics may be that because Black can find bodies with his gift, it may raise public expectations about what to expect from self-proclaimed psychic sleuths and make it easier for skeptics to point out that this is what real psychic detectives *should* be doing if their powers were real. Outside of Hollywood, it's rare for the psychic to even be present when a body is found.

NBC's other supernatural show has tried to be a clone of *The X-Files*. But the producers of *Dark Skies* clearly failed to grasp the ingredients that have made the original so popular.

While *The X-Files* is still revealing the truth about UFO abductions at a slow and maddeningly enigmatic pace, *Dark Skies* spilled the whole story in its two-hour premiere.

The premise: a flying saucer crashed near Roswell, New Mexico, in 1947; extraterrestrials were recovered and autopsies performed; the government is trying to cover it up; the whole operation is run by a powerful, autonomous group known as Majestic-12. So far, so boring.

The big news in *Dark Skies* is that the *real* aliens are actually small creatures that have inhabited the bodies of the extraterrestrials (think *Alien*, *Aliens*, and *Aliens-3*). In addition, the little buggers, known as the Hive, can worm their way into human brains, controlling our actions (think *Invasion of the Body Snatchers*).

And when an aggressive Congressional aide, after inexplicably being brought into the Majestic-12 operation, decides to inform President Kennedy, the Majestic conspirators stage JFK's assassination. (Filmmaker Oliver Stone is probably disappointed that he missed this particular theory.)

Thus, the aide and his girlfriend flee, always trying to stay one step ahead of the government agents and other humans who are possessed by the aliens (think *The Invaders*).

The real attraction of this show is its willingness to recast much of history in the mold of an extraterrestrial invasion. By the end of November, *Dark Skies* had blamed the aliens for everything from Howard Hughes' bizarre behavior to the massive Good Friday earthquake in Alaska on March 27, 1964.

It soon became clear that these shows may not be around long (and they may be gone by the time this article is published). *Millennium* started off strong, but by November 1 and 8 it had dropped to fifty-eighth place in the ratings. During those same weeks, *Profiler* couldn't get above sixty-first place, and *Dark Skies* scored no higher than eighty-third.

One of the strangest shows of the new season, and one that didn't show up in the regular ratings because it was syndicated, has been *Psi Factor: Chronicles of the Paranormal*. The program is extraordinarily moronic because it tries so hard to look like it's depicting authentic cases of the supernatural.

It begins with the claim that the paranormal stories dramatized on the program are based on actual case files from the Office of Scientific Investigation and Research (OSIR). Then host/producer/actor Dan Aykroyd gives an opening narration while standing in front of what appears to be a laboratory of some sort. It made me wonder if the show was using stories collected by a small group of self-proclaimed psychic investigators in California with a scientific-sounding name and some files describing pseudo-investigations.

But it quickly became clear that the whole thing was a lot of hooey. The "cases" themselves are bizarre, even for most parapsychologists. The show depicts the OSIR as a well-funded, quasi-military agency with authority that "supersedes all private and local, national and international laws." At this point, anybody who believes that the U.S. would surrender its sovereign rights to this group, that OSIR really has such powers, and that "cases" happened the way they are depicted probably still waits for annual visits from the Easter Bunny.

Aykroyd, who has a strong interest in the paranormal, doesn't help the show's credibility. In his introduction to each segment, he tries to sound like a cross between Rod Serling and Jack Webb, but he comes off looking like one of his *Saturday Night Live* characters. And with a history of comic movie roles that include playing an alien (*Coneheads*), marrying an alien (*My Stepmother Is An Alien*), and tracking down ghosts (*Ghostbusters* and *Ghostbusters 2*), it's hard to imagine anyone taking this show seriously.

The season's fascination with the supernatural also spilled over to games for personal computers. There was *The Pandora Directive* (down-on-his-luck gumshoe finds secret Roswell military base, discovers alien spacecraft, uncovers alien-autopsy movie that looks more authentic than the "real" one), *Timelapse* (space aliens gave us the pyramids, Easter Island statues, and Atlantis), *Area 51* (shoot alien invaders), *The Real Adventures of Jonny Quest: Cover-up at Roswell* (Jonny finds a surviving alien), and *Drowned God* (the

MEDIA WATCH continued on page 57

Methane Missiles and Comet Tales

Has the Deep Mystery of the Bermuda Triangle finally been solved? According to one Richard McIver, who claims to be a gas and oil expert and former industry consultant, it has: monstrous-sized bubbles of methane gas escaping from a supposedly huge underground deposit locked in sediment under the ocean's floor, occasionally released by earthquakes or fissures or whatever. He gave the following highly technical explanation to the *National Enquirer* (August 13, 1996): "Imagine shaking a giant soda can. The ocean would fizz and boil with gas." Any ship that happened by would, he suggested, sink instantly into the pockets of methane. Furthermore, "sailors would be gassed because methane is poisonous, or the ship would be blown up if the methane got ignited by a heat source or spark on board." Well, I guess that explains that. But what about the supposedly mysterious disappearance of airplanes as well? Even air travelers are at risk, according to McIver: "As the lighter-than-air bubbles soared into the air, they would destabilize any planes flying overhead by causing tremendous turbulence—or engulf them in a fireball if the methane exploded." It all sounds like "swamp gas" to me.

But if flying over the Bermuda Triangle isn't scary enough, there is always that large, mysterious "Saturn-Like Object" (SLO) that astronomers reportedly have sighted hovering in the vicinity of comet Hale-Bopp. As you may know, that comet promises to be a dramatic sight when it passes through the inner solar system this spring. In 1995, Art Bell, the wild-story-spinner of late-night radio, claimed to have information that Hale-Bopp, one of the largest comets ever discovered, was on a collision course with Earth. NASA was, of course, covering up the horrific news.

Somehow, that danger faded quietly away, soon to be replaced by the Saturn-Like Object. No sooner was its discovery reported by the conspiracy-oriented amateur astronomer Chuck Shramek last November 14, than he was put on the air by Art Bell, whose syndicated show "Coast to Coast" is heard throughout the country, to tell people all about it. "There are some very strange and weird aspects to this comet [Hale-Bopp] which officials seem reluctant to tell us about or discuss," states Shramek on his web page. "The orbit of the comet is very strange—as if some intelligence had engineered a comet to get our attention." The claim may well be preposterous, but Bell is no fool: he keeps pulling in top ratings coast-to-coast. Bell put a couple photos of the SLO on his web page (http://www.artbell.com), which look remarkably like ordinary photographic artifacts. Frankly, Bell's collection of photos of El Chupacabras (an amazing monster supposedly responsible for cattle mutilations in Latin America) look much more interesting. (When cattle suddenly die and get chewed up, if the rancher speaks English, space aliens will get the blame, but if the rancher speaks Spanish, it will be the work of El Chupacabras. While visiting Art Bell's site, don't neglect to check out his "Ghost Page.")

Enter Courtney Brown, an associate professor of political science at Emory University in Atlanta who, now that he has tenure, can spout whatever nonsense suits his fancy. In his new book, *Cosmic Voyage*, Brown explains how he and others have used "Scientific Remote Viewing" (SRV) to retrieve data from great distances and across time. He has discovered evidence of not one but two distinct species of intelligent alien beings, the "greys" and the "Martians," the latter group being humanoid. Brown is the director of the Farsight Institute for the Advancement of Scientific Remote Viewing, and an old buddy of Art Bell, so he undertook a further investigation of the mysterious interplanetary interloper. Brown sent a crack team of three professional remote viewers to zoom up and out from their armchairs to the vicinity of Hale-Bopp for a close-up look at the alleged SLO. "Professional 1" saw a large, dense magnetic object, "powerful, ominous, and centrifugal," and declared that "the Galactic Council,

Robert Sheaffer's World Wide Web page for UFOs and other skeptical subjects is at http://debunker.com/~sheaffer/ufo.html.

or some higher order, is watching very interested." "Professional 2" discerned that the target involved "glowing physical energy," which was deduced to be a climate-controlled space capsule. "Professional 3" confirmed that the object is indeed a spaceship, describing it as "hard, smooth, and rounded," adding that "at times it emits energy."

But not everyone is impressed by these observations. Alan Hale, co-discoverer of the giant comet, says "the mere fact that this was discussed on the Art Bell show is enough in itself to raise suspicions." He calls Art Bell's show "the *Weekly World News* of the late-night-radio talk-show circuit." Hale has determined that the SLO photographed near the comet is in fact a star of magnitude 8.5 known as SAO 141894, seen distorted by diffraction effects. (See the complete analysis on the comet's official homepage at http://www.halebopp.com, as well as Alan Hale's article in this issue.)

But even if the scares about the giant methane bubbles and the Saturn-Like Object ultimately turn out to be false alarms, there is still the menace of the "demon seeds," whose picture also appears on Art Bell's web site. According to the accompanying text, these seeds, if planted, "will produce a meat-eating plant that will take over your entire yard." But having seen our share of horror movies, we are wondering: Why would it stop there? □

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Hale-Bopp Comet Madness

Most of the excitement surrounding Hale-Bopp's approach has a legitimate scientific and popular basis, but other aspects of the "comet madness" are pseudoscientific and a glaring symptom of scientific illiteracy.

ALAN HALE

Due to its almost unprecedented intrinsic brightness at the time of its discovery by Alan Hale and Thomas Bopp in July 1995, Comet Hale-Bopp has stimulated enormous scientific and popular interest. The comet has also recently stimulated a goodly amount of irrational and pseudoscientific speculation. Astronomer and co-discoverer Alan Hale considers the comet's forthcoming nearest approach an opportunity for public education in science. We invited him to put the interest surrounding Comet Hale-Bopp into scientific perspective and to comment on the various sensational claims accompanying it. We also publish his "An Astronomer's Personal Statement on UFOs."

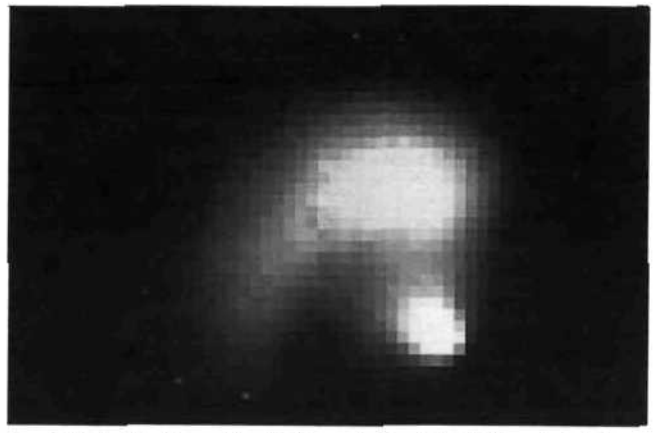
—Kendrick Frazier, Editor

Few sights in the nighttime sky can be more awe-inspiring than that of a bright comet. Consisting of a bright, diffuse, circular patch of light—the head, or "coma"—accompanied by a ghostly tail which may stretch across a considerable span of the heavens, such objects definitely rank among the most noticeable, and the most beautiful, of any of the celestial phenomena we encounter. The relative rarity with which a bright comet may appear in our skies—about once every one to two decades, on the average—ensures that, when they do appear, attention is paid to them.

To our ancestors of a few centuries ago, who did not have available the knowledge of the universe's workings that we have today, such a sight must truly have been remarkable. More often than not, a bright comet would almost seem to appear "out of nowhere," be visible in the skies for perhaps two to four weeks, then disappear again "into nowhere." It was only natural for our ancestors to associate the appearance of comets with whatever misfortunes were occurring on Earth—of which there is never a shortage—and to interpret them in line with their particular religious beliefs and mythologies. For example, a bright comet (apparently the Great Comet of 1680) caused a handbill bearing the following text to be circulated among the Christians in eastern Europe:

> Herewith is represented the fearful celestial phenomenon and other events . . . by which Almighty God terrified dear Hungary, and at the same time admonished Christendom to penance. . . . The star pointed toward Moravia, its tail toward Turkey. The star was very large and bright, not like fire but white like moonlight. The tail was curved with serpentine bends like a lightning flash. It was pierced by several arrows, and toward the end of the tail was something like a Turkish feather fan. The tail itself terminated in seven points directed toward Turkey. There was a crown over the end of the tail, while another crown surrounded by clouds was to be seen below the midpart of the comet. Close by appeared the heads of two Turks and some moon-like faces that were partially ball-like. . . . We are sure that the celestial phenomenon was a terrible New Year's admonition, the interpretation of which we will leave to Omniscient God, Whose grace gives us vigilant hearts, withdraws all miseries from our cottages, and Who turns the threatening arrows against the enemies of His church. . . .

We have learned much about these visitors in the centuries since the above handbill was issued. In the early eighteenth century the British astronomer Edmond Halley applied the laws of gravitation as worked out by his friend Isaac Newton and determined that at least one comet appeared to be making periodic visits to our skies, a supposition that was spectacularly verified when this comet returned in 1759. Since that time, well over a hundred other comets have been observed to make repeat appearances in our skies, and periodic elliptical orbits have been computed for numerous others, establishing beyond all doubt that comets are *bona fide* members of the solar system, like the planets with which we are perhaps more familiar.



Comet photo: H.A. Weaver (Applied Research Corp.), P.D. Feldman (The Johns Hopkins University), and NASA.

The advent of larger telescopes and, in the late nineteenth century, astrophotography has revealed that comets are far more common visitors than were first thought; up to two dozen or more may make their passages through the inner solar system during any given year. (The overwhelming majority of these are faint objects that require large telescopes in order to be detected, although well-equipped and knowledgeable amateur astronomers should be able to view two or three comets during any given clear night, on the average.)

The physical nature of comets was a matter of much conjecture for some time, with the most prevalent idea, proposed by American astronomer Fred Whipple in the early 1950s, being that a comet could be described as a "dirty snowball," a solid object composed of a mixture of water ice, various other frozen volatile substances such as carbon monoxide, carbon dioxide, and others, and significant amounts of interplanetary dust grains. Recent detailed studies of comets, foremost among them being the flybys of Halley's Comet in 1986 by the European Space Agency's Giotto spacecraft along with several other missions, have revealed that Whipple's "dirty snowball" model was essentially correct, with a variety of other substances, including various organic compounds, being present within the nuclei of comets as well. Most scientists today accept the idea that comets are "leftovers" from the solar system's planetary formation process four and a half billion years ago, and, as a result, comets are now intensely scrutinized for any clues they might offer as to the physical and chemical conditions that were prevalent at that time.

With all the knowledge about comets that we have gained during the past few centuries, one would think that there would no longer exist any reasons to fear these visitors into the inner solar system. Unhappily, this has not been the case, as the twentieth century has seen its share of "comet madness." The return of Halley's Comet in 1910 sparked much mass panic, especially once astronomers pointed out the possibility that the earth might pass through a portion of the comet's tail. While a comet's tail does contain gases that might be consid-

Astronomer Alan Hale is co-discoverer of Comet Hale-Bopp and director of the Southwest Institute for Space Research, Cloudcroft, NM 88317. His book Everybody's Comet: A Layman's Guide to Comet Hale-Bopp *(High-Lonesome Books of Silver City, New Mexico) has just gone into a second printing.*

ered "poisonous"—cyanogen, for example—the material in the tail is so rarefied that it would make a good vacuum by terrestrial standards. Although this was clearly pointed out to the general public in 1910, it did not prevent outbreaks of hysteria from erupting over parts of the world, nor did it prevent several enterprising entrepreneurs from earning brief fortunes by selling "comet pills" and the like. More recently, the appearance of Comet Kohoutek in 1973 inspired several apocalyptic proclamations by certain religious groups, statements which in retrospect seem even more ridiculous than they otherwise would have in light of the comet's failure to achieve its expected brilliance. (Comet Kohoutek, to be sure, was an exceptionally rewarding object from a scientific perspective, even if it did disappoint the casual viewer.)

We are now seeing a resurgence of "comet madness" accompanying the impending appearance of Comet Hale-Bopp. In some ways this object, discovered by myself and Arizona amateur astronomer Thomas Bopp in July 1995, *is* unusual; its intrinsic brightness appears to be one of the highest ever recorded for a comet, and its discovery when located well beyond the orbit of Jupiter and over a year and a half away from its passage through the inner solar system is almost unprecedented in the history of these objects. Nevertheless, a seven-foot-tall human being is still a human being, and likewise Comet Hale-Bopp, despite its apparent large size and brightness, is no less and no more of a "dirty snowball" than are any of the other two dozen or so comets that will pass around the sun in 1997. Many of the chemical constituents that were detected in previous comets have now been detected in Hale-Bopp, and the evolution of its activity level has more or less followed the expectations that were derived from studies of earlier comets.

Much of the "comet madness" associated with Comet Hale-Bopp focuses on the fact that its appearance coincides rather closely with the end of the second millennium which, despite the fact that this is an arbitrary point in time, is being viewed by a disturbingly large segment of the public as an omen of significant upheaval (see the article by Lee Loevinger in the January/February SKEPTICAL INQUIRER.) Several Christian fundamentalists have proclaimed that Hale-Bopp could be one of the "signs of the end times" as foretold in several New Testament prophecies, and some have gone so far as to suggest that Hale-Bopp might be the star "Wormwood" discussed in Revelation 8:10–11. (For the record, Hale-Bopp comes nowhere near the earth during its passage through the inner solar system; at closest approach, to occur on March 22, 1997, the comet is 1.3 astronomical units—122 million miles, or 197 million kilometers—from our planet.) Several New Age devotees have claimed they have found references to Comet Hale-Bopp within the writings of Nostradamus and within various Native American legends. Whatever the source of the "prophecy," Hale-Bopp's appearance three years before the end of the millennium is generating an apocalyptic upswelling on a scale rarely seen since the era epitomized by the Hungarian handbill discussed above.

Another source of the "comet madness" centered around Hale-Bopp is tied to the ongoing belief among a significant fraction of the public that Earth is being visited in large numbers by extraterrestrial aliens. (As one radio host recently and appropriately described to me, this seems to be the "new mythology" that is replacing the older religion-based myths.) Almost from the time of Hale-Bopp's discovery there have been claims that Hale-Bopp is some kind of alien "mother ship" or, at the very least, is "under intelligent control." Some of these claims have been based upon reputed "course corrections" that the comet has allegedly undergone since its discovery. Many of these claims have not been restricted to the tabloid media but instead seem to have undergone widespread dissemination among the more "mainstream" elements of the press and have consequently become fairly widespread among the public.

The numerous scientific and technological challenges that our society will be faced with . . . are too important and too complex to be adequately met and dealt with by a population that cannot distinguish between legitimate science and pseudoscience.

Like many such pseudoscientific claims, there is an element of truth contained within these. The "course-corrections" claim very possibly arose from the fact that the initial calculations of Hale-Bopp's orbit, based upon extremely limited data and labeled as "highly uncertain" when they were published, differed in some particulars from the more definitive orbits published subsequently. (This is not at all unusual, incidentally, and has happened with numerous other comets.) Also, cometary orbits do experience slight changes as a result of planetary perturbations and also through the process of outgassing, which tends to produce tiny rocket-like effects acting upon the comet's icy nucleus. To my knowledge, this phenomenon, described under the term "nongravitational forces," has not yet been observed in Hale-Bopp, although it surely must be occurring at a level too low for us to detect at this time.

A recent incident illustrates just how widespread this belief that aliens are associated with Hale-Bopp has become. On November 14, 1996, an observer in Houston obtained electronic images through his telescope showing an alleged "mysterious Saturn-like object" following the comet. That same evening, this individual appeared as a guest on the Art Bell radio show, a nationwide call-in program that could perhaps be charitably described as "tabloid" radio (see Robert Sheaffer's "Psychic Vibrations" column, this issue). There apparently was speculation on this program that the "Saturn-like object" was in fact an alien spacecraft, four times larger than Earth, following along behind the comet. Despite the absurd nature of these claims, this story was picked up by several elements of the "mainstream" press, and throughout the following day I was contacted by numerous radio and television stations from

around the country soliciting my comments on the "mysterious spacecraft" following "your comet."

My investigation of this took me first to the World Wide Web homepage of the Houston photographer, which contained several apocalypse-suggestive statements about Hale-Bopp as well as numerous allegations of government coverups and conspiracies (including references to known "fringe" writers like Richard Hoagland and Zecharia Sitchin). These strongly suggested that this individual was predisposed to come to "strange" conclusions about the comet. Even more important, once I was able to examine the images in question, and could match the surrounding star field with a photograph of the same region of the sky taken during the course of the Palomar Sky Survey in the early 1950s, I found that the location of the "Saturn-like object" coincided perfectly with a bright 8th-magnitude star that the comet just happened to be located next to on the night in question. The "Saturn-like rings" extending from the "object" were apparently nothing more than a diffraction effect, a common occurrence with over-exposed stellar images on astronomical photographs. (It has also recently come to light that the particular CCD—charge-coupled device, an electronic detector—camera used to take the photographs in question is of a type that is highly sensitive to infrared wavelengths, and that the star in question is a red giant and consequently more luminous in the infrared than in the visible part of the spectrum.)

Numerous other astronomers who investigated this came to the same conclusion I did, and in an effort to redirect the flood of inquiries I was receiving I posted the results of my explanation, along with the appropriate photographs, on the Hale-Bopp homepage (http://www.halebopp.com). My explanation there apparently generated an enormous amount of discussion on the Art Bell program and elsewhere, and led to a large amount of surprisingly vicious "hate mail" being sent to www.halebopp.com, as well as numerous accusations that I am involved in the "conspiracy" that is "hiding information" about Hale-Bopp. (For the record, I continue to be an all-but-unemployed astronomer, and I have not received a single government paycheck for any involvement I have had with this comet!) This claim of an alien spacecraft following Hale-Bopp has refused to die since that time, with one persistent claim being that a "famous astrophysicist . . . affiliated with a top-ten university" has verified the existence of this object and would announce it via a major press conference (which has now been "imminent" for almost a month as of this writing). What I've found most fascinating are the numerous falsehoods that are being written about me—for example, the claim that I have "changed my story" and am no longer claiming that the "Saturn-like object" was a background star, but instead am offering some other "explanation."

Although I find this entire episode of the "Saturn-like object" and all the other pseudoscientific claims surrounding Comet Hale-Bopp quite amusing, the fact that claims such as these receive such widespread acceptance among large segments of the general public is not something that we scientists and rationalists should dismiss lightly. This whole phenomenon of "Hale-Bopp madness" strikes me as a glaring example of the scientific illiteracy that pervades our society and that has been addressed many times in the pages of this magazine and so eloquently by Carl Sagan in *The Demon-Haunted World.*

It is imperative that we, the scientists and *rationalists of today, diligently work toward* alleviating this scientific illiteracy . . .

The numerous scientific and technological challenges that our society will be faced with during the years and decades ahead are too important and too complex to be adequately met and dealt with by a population that cannot distinguish between legitimate science and the pseudoscience that is so prevalent now. It is imperative that we, the scientists and rationalists of today, diligently work toward alleviating this scientific illiteracy, a quest that has become even more important due to the recent losses of such prominent voices for rationalism as Isaac Asimov and Carl Sagan.

Fortunately, I believe that Comet Hale-Bopp provides a unique and perhaps unprecedented opportunity to work toward this goal. The comet is already attracting an enormous amount of attention from the nonscientific world, and this can only be expected to increase as it makes its passage through the inner solar system during the coming few months. (At this writing the comet is continuing to brighten more or less "as it should," and thus the prospects for a spectacular display continue to be encouraging, although one should keep in mind that a Kohoutek-like performance is still very much within the realm of possibility.)

When Hale-Bopp is brightest, it should be easily visible to the unaided eye of anyone in the world, and at that time perhaps the best thing we can do is to encourage everyone simply to *look!* I have challenged numerous "believers" of an extraterrestrial object following Hale-Bopp not to take my word for anything, but to go out and look at the comet for themselves and see if there is indeed any "object" accompanying it. (As I write this, the comet is slightly beyond the orbit of Mars, and already any spacecraft "four times larger than Earth" would be among the brightest objects in the nighttime sky.)

And while we're at it, let's encourage those who are gazing cometward to take a few moments to look at some of the other wonders of the universe around us and point out to them that there is far more to be in awe of in the real world than there could ever be in the pseudoscience we are encountering today. Recently, on a radio talk show where I had asserted that there is no spacecraft following Hale-Bopp and that if any listeners doubted me they should go look at the comet for themselves, the program's host told me that I was "taking all the fun out of this." Hale-Bopp is an opportunity to show our fellow citizens of Earth that the pursuit of knowledge of the real world and universe around us is far more "fun" than pseudoscience could ever be. □

An Astronomer's Personal Statement on UFOs

ALAN HALE

When I am confronted with beliefs about UFOs or other paranormal phenomena—or, for that matter, just about *anything*—I am guided by three basic principles, to wit:

1) *Extraordinary claims require extraordinary evidence.* The discovery that there are other intelligent beings in the universe—and, as a corollary, that life and intelligence can and has evolved at locations other than Earth—and that, moreover, these beings are visiting Earth on a semi-regular basis in spacecraft that seem to defy the laws of physics as we now know them, would unquestionably rank as the greatest discovery in the history of science, and most definitely is an extraordinary claim. Therefore, in order for me to accept it, you must produce extraordinary evidence. What might this evidence be? For one thing, the aliens themselves. Not some story where someone says that someone says that someone says that they saw aliens, but the actual physical aliens themselves, where I and other trustworthy and competent scientists and individuals can study and communicate with them. I'd like to examine their spacecraft and learn the physical principles under which it operates. I'd like a ride on that spacecraft. I'd like to see their star charts and see where the aliens come from. I'd like to know the astronomical, physical, chemical, and biological conditions of their home world and solar system, and how they compare with and contrast with ours. If possible, I'd like to visit their home world, and any other worlds that might be within their sphere of influence. In other words, I want the aliens visible front and center, where there can be *no reasonable doubt* as to their existence. Stories about "lights" or "things" in the sky do not impress me, especially when such reports come from people who have no idea of the vast array of natural and man-made phenomena that are visible in the sky if one would only take the time to look.

2) *The burden of proof is on the positive.* If you are making an extraordinary claim, the burden is on you to produce the extraordinary evidence to prove that you are correct; the burden is not on me to prove that you are wrong. Furthermore, you must prove your case by providing the direct and compelling evidence for it; you can't prove it by eliminating a few token explanations and then crying, "Well, what else can it be?"

3) *Occam's Razor: If one is confronted with a series of phenomena for which there exists more than one viable explanation, one should choose the simplest explanation which fits all the observed facts.* It is an undeniable fact that many people have seen, or at least claimed to see, objects in the sky and on the ground for which they have no explanation. But it is also an undeniable fact that people can make mistakes about their observations. It is an undeniable fact that reports can come from people who are unaware of the various phenomena that are visible in the sky and from people who are not equipped or trained at making reliable scientific observations. It is an undeniable fact that a person's preconceived notions and expectations can affect his/her observations. It is an undeniable fact that some people will lie and will create hoaxes for any one of various reasons. Taking all these undeniable facts together, the simplest explanation—to me, anyway—for the UFO phenomenon is that every report is either a hoax or is a mistake of some sort. If this explanation is incorrect, then you have to increase the sphere of undeniable facts; and for this, see points 1) and 2) above.

To me, it seems extremely likely that life has started and evolved at other sites throughout the universe, quite possibly in a great number of places. It also seems rather possible that, at some of those sites, evolution has created

an intelligent species which has developed technology far in advance of our own and which might be capable of interstellar space flight. Despite the incredible distances between stars, and despite the vast dispersion in evolutionary states that must exist throughout the sphere of races that have achieved some sort of sentience, it is possible—although, to me, extremely unlikely—that one or more of these races has visited Earth within the relatively recent past. Indeed, I would be absolutely ecstatic if any such visits have taken place. No one would be happier than me to meet with and converse with these beings and, I dare say, there are very few people who are better prepared intellectually and emotionally to deal with this prospect if it were to occur. But again, I want the direct evidence for their existence; I want the aliens themselves. I don't want to hear stories about some "thing" that some person somewhere might have seen.

As a lifelong amateur astronomer, as a professional astronomer, as someone who has read countless science fiction stories and scientific essays, I have devoted my life to unraveling the secrets of the universe and to pushing humanity and humanity's knowledge as far into space as I can. (This is my reason for claiming that there are few people in the world who are better prepared than I am to meet with an alien race; if there is any human being who *could* meet with alien beings, it would be someone like me.) At the same time, I suspect there is hardly anyone who watches and studies the sky more than I do, and while I have almost continuously observed the sky for most of my lifetime, I have yet to see a single object for which there was not a prosaic explanation. I *have* seen such diverse phenomena as: fireballs, rocket launches, satellite reentries, comets, auroras, bright planets, novae, orbiting satellites, ionospheric experiments, high-altitude balloons—all of which have been reported as "UFOs" by uninformed witnesses. If indeed there are alien spacecraft flying around Earth with the frequency with which UFO devotees are claiming, then I must ask how come I have never seen anything remotely resembling such an object, while at the same time I have managed to see all these various other types of phenomena.

In summary, I consider it likely that there are advanced alien races somewhere "out there," and I remain open to the possibility that, unlikely as it may seem, one or more such races could be visiting Earth. But if so, where are they? If they possess the technology capable of traveling interstellar distances, then they are so far ahead of us that there can be no reason for them to be afraid of us. If they wish to hide from us, they could do so easily; if they don't wish to, then they have no need to play games with us and only show themselves to a few unwitting individuals. Let them reveal themselves to humanity at large, to our scientists, and to me. □

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WITH. ROCKY MOUNTAIN SKEPTICS

Some Systematic Biases of Everyday Judgment

Skeptics have long thought that everyday judgment and reasoning are biased in predictable ways. Psychological research on the subject conducted during the past quarter century largely confirms these suspicions.

THOMAS GILOVICH

Two types of explanations are typically offered for the dubious beliefs that are dissected in SKEPTICAL INQUIRER. On one hand, there are motivational causes: Some beliefs are comforting, and so people embrace that comfort and convince themselves that a questionable proposition is true. Many types of religious beliefs, for example, are often explained this way. On the other hand, there are cognitive causes: faulty processes of reasoning and judgment that lead people to misevaluate the evidence of their everyday experience. The skeptical community is convinced that everyday judgment and reasoning leave much to be desired.

Why are skeptics so unimpressed with the reasoning abilities and habits of the average person? Until recently, this pessimism was based on simple observation, often by those with a particularly keen eye for the foibles of human nature. Thus, skeptics often cite such thinkers as Francis Bacon, who stated:

> . . . all superstition is much the same whether it be that of astrology, dreams, omens, retributive judgment, or the like . . . [in that] the deluded believers observe events which are fulfilled, but neglect or pass over their failure, though it be much more common. (Bacon 1899/1620)

John Stuart Mill and Bertrand Russell are two other classic scholars who, along with Bacon, are often quoted for their trenchant observations on the shortcomings of human judgment. It is also common to see similar quotes of more recent vintage—in SKEPTICAL INQUIRER and elsewhere—from the likes of Richard Feynman, Stephen Jay Gould, and Carl Sagan.

During the past twenty-five years, a great deal of psychological research has dealt specifically with the quality of everyday reasoning, and so it is now possible to go beyond simple observation and arrive at a truly rigorous assessment of the shortcomings of everyday judgment. In so doing, we can determine whether or not these scholars we all admire are correct. Do people misevaluate evidence in the very ways and for the very reasons that Bacon, Russell, and others have claimed? Let us look at the research record and see.

The "Compared to What?" Problem

Some of the common claims about the fallibility of human reasoning stand up well to empirical scrutiny. For example, it is commonly argued that people have difficulty with what might be called the "compared to what" problem. That is, people are often overly impressed with an absolute statistic without recognizing that its true import can only be assessed by comparison to some relevant baseline.

For instance, a 1986 article in *Discover* magazine (cited in Dawes 1988) urges readers who fly in airplanes to "know where the exits are and rehearse in your mind exactly how to get to them." Why? The article approvingly notes that someone who interviewed almost two hundred survivors of fatal airline accidents found that ". . . more than 90% had their escape routes mentally mapped out beforehand." Good for them, but note that whoever did the study cannot interview anyone who perished in an airplane crash. Air travel being as scary as it is to so many people, perhaps 90 percent or more of those who died in airline crashes rehearsed their escape routes as well. Ninety percent sounds impressive because it is so close to 100 percent. But without a more pertinent comparison, it really does not mean much.

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Similarly, people are often impressed that, say, 30 percent of all infertile couples who adopt a child subsequently conceive. That is great news for that 30 percent to be sure, but what percentage of those who do not adopt likewise conceive? People likewise draw broad conclusions from a cancer patient who goes into remission after steadfastly practicing mental imagery. Again, excellent news for that individual, but might the cancer have gone into remission even if the person had not practiced mental imagery?

This problem of failing to invoke a relevant baseline of comparison is particularly common when the class of data that requires inspection is inherently difficult to collect. Consider, for example, the commonly expressed opinion, "I can always tell that someone is wearing a hairpiece." Are such claims to be believed, or is it just that one can tell that someone is wearing a hairpiece . . . when it is obvious that he is wearing a hairpiece? After all, how can one tell whether some have gone undetected? The goal of a good hairpiece is to fool the public, and so the example is one of those cases in which the confirmations speak loudly while the disconfirmations remain silent.

A similar asymmetry should give pause to those who have extreme confidence in their "gaydar," or their ability to detect whether someone is gay. Here, too, the confirmations announce themselves. When a person for whatever reason "seems gay" and it is later determined that he is, it is a salient triumph for one's skill at detection. But people who elude one's gaydar rarely go out of their way to announce, "By the way, I fooled you: I'm gay."

At any rate, the notion that people have difficulty invoking relevant comparisons has received support from psychological research. Studies of everyday reasoning have shown that the logic and necessity of control groups, for example, is often lost on a large segment of even the educated population (Boring 1954; Einhorn and Hogarth 1978; Nisbett and Ross 1980).

The "Seek and Ye Shall Find" Problem

Another common claim that stands up well to empirical research is the idea that people do not assess hypotheses evenhandedly. Rather, they tend to seek out confirmatory evidence for what they suspect to be true, a tendency that has the effect of "seek and ye shall find." A biased search for confirmatory information frequently turns up more apparent support for a hypothesis than is justified.

This phenomenon has been demonstrated in numerous experiments explicitly designed to assess people's hypothesis-testing strategies (Skov and Sherman 1986; Snyder and Swann 1978). But it is so pervasive that it can also be seen in studies designed with an entirely different agenda in mind. One of my personal favorites is a study in which participants were given the following information (Shafir 1993):

> Imagine that you serve on the jury of an only-child sole-custody case following a relatively messy divorce. The facts of the case are complicated by ambiguous economic, social, and emotional considerations, and you decide to base your decision entirely on the following few observations. To which parent would you award sole custody of the child?

Parent A: average income
average health
average working hours
reasonable rapport with the child
relatively stable social life

Parent B: above-average income
minor health problems
lots of work-related travel
very close relationship with the child
extremely active social life

Faced with this version of the problem, the majority of respondents chose to award custody to Parent B, the "mixed bag" parent who offers several advantages (above-average income), but also some disadvantages (health problems), in comparison to Parent A. In another version of the problem, however, a different group is asked to which parent they would *deny* custody of the child. Here, too, a majority selects Parent B. Parent B, then, is paradoxically deemed both more and less worthy of caring for the child.

The result is paradoxical, that is, unless one takes into account people's tendencies to seek out confirming information. Asked which parent should be *awarded* the child, people look primarily for positive qualities that warrant being awarded the child—looking less vigilantly for negative characteristics that would lead one to favor the other parent. When asked which parent should be *denied* custody, on the other hand, people look primarily for negative qualities that would disqualify a parent. A decision to award or deny, of course, should be based on a comparison of the positive *and* negative characteristics of the two parents, but the way the question is framed channels respondents down a narrower path in which they focus on information that would confirm the type of verdict they are asked to render.

The same logic often rears its head when people test certain suppositions or hypotheses. Rumors of some dark conspiracy, for example, can lead people to search disproportionately for evidence that supports the plot and neglect evidence that contradicts it.

The Selective Memory Problem

A third commonly sounded complaint about everyday human thought is that people are more inclined to remember information that fits their expectations than information at variance with their expectations. Charles Darwin, for example, said that he took great care to record any observation that was inconsistent with his theories because "I had found by experience that such facts and thoughts were far more apt to escape from the memory than favourable ones" (cited in Clark 1984).

This particular criticism of the average person's cognitive faculties is in need of revision. Memory research has shown that often people have the easiest time recalling information that is *inconsistent* with their expectations or preferences (Bargh and Thein 1985; Srull and Wyer 1989). A little reflection indicates that this is particularly true of those "near misses" in life that become indelibly etched in the brain. The novelist Nicholson Baker (1991) provides a perfect illustration:

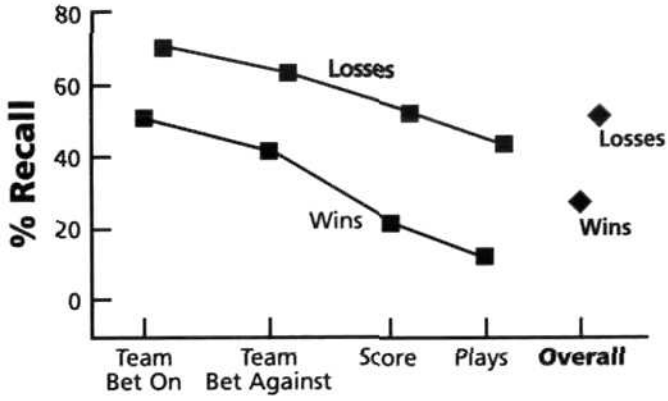

Figure 1. Gamblers' recall of information about bets won and lost. (From Gilovich 1983.)

> [I] told her my terrible story of coming in second in the spelling bee in second grade by spelling *keep* "c-e-e-p" after successfully tossing off *microphone*, and how for two or three years afterward I was pained every time a yellow garbage truck drove by on Highland Avenue and I saw the capitals printed on it, "Help Keep Our City Clean," with that impossible irrational K that had made me lose so humiliatingly. . . .

Baker's account, of course, is only an anecdote, possibly an apocryphal one at that. But it is one that, as mentioned above, receives support from more systematic studies. In one study, for example, individuals who had bet on professional football games were later asked to recall as much as they could about the various bets they had made (Gilovich 1983). They recalled significantly more information about their losses—outcomes they most likely did not expect to have happen and certainly did not *prefer* to have happen (see Figure 1).

Thus, the simple idea that people remember best that which they expect or prefer needs modification. Still, there is something appealing and seemingly true about the idea, and it should not be discarded prematurely. When considering people's belief in the accuracy of psychic forecasts, for example, it certainly seems to be fed by selective memory for successful predictions.

How then can we reconcile this idea with the finding that often *inconsistent* information is better recalled? Perhaps the solution lies in considering when an event is *eventful*. With respect to their capacity to grab attention, some events are one-sided and others two-sided. Two-sided events are those that stand out and psychologically register as events regardless of how they turn out. If you bet on a sporting event or an election result, for example, either outcome—a win or a loss—has emotional significance and is therefore likely to emerge from the stream of everyday experience and register as an event. For these events, it is doubtful that confirmatory information is typically better remembered than disconfirmatory information.

In contrast, suppose you believe that "the telephone always rings when I'm in the shower." The potentially relevant events here are one-sided. If the phone happens to ring while showering, it will certainly register as an event, as you experience great stress in deciding whether to answer it, and you run drip-

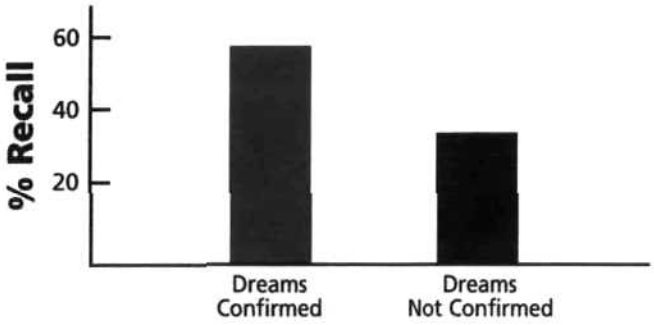

Figure 2. Participants' recall of dream prophecies that were either confirmed or unconfirmed. (Adapted from Madey 1993.)

ping wet to the phone only to discover that it is someone from AT&T asking if you are satisfied with your long-distance carrier. When the phone does *not* ring when you are in the shower, on the other hand, it is a non-event. Nothing happened. Thus, with respect to the belief that the phone always rings while you are in the shower, the events are inherently one-sided: Only the confirmations stand out.

Perhaps it is these one-sided events to which Bacon's and Darwin's comments best apply. For one-sided events, as I discuss below, it is often the outcomes consistent with expectations that stand out and are more likely to be remembered. For two-sided events, on the other hand, the two types of outcomes are likely to be equally memorable; or, on occasion, events inconsistent with expectations may be more memorable.

But what determines whether an event is one- or two-sided? There are doubtless several factors. Let's consider two of them in the context of psychic predictions. First, events relevant to psychic predictions are inherently one-sided in the sense that such predictions are disconfirmed not by any specific event, but by their accumulated failure to be confirmed. Thus, the relevant comparison here is between confirmations and non-confirmations, or between events and non-events. It is no surprise, surely, that events are typically more memorable than non-events.

In one test of this idea, a group of college students read a diary purportedly written by another student, who described herself as having an interest in the prophetic nature of dreams (Madey 1993). To test whether there was any validity to dream prophecy, she decided to record each night's dreams and keep a record of significant events in her life, and later determine if there was any connection between the two. Half of the dreams (e.g., "I saw lots of people being happy") were later followed by events that could be seen as fulfilling ("My professor cancelled our final, which produced cheers throughout the class"). The other half went unfulfilled.

After reading the entire diary and completing a brief "filler" task, the participants were asked to recall as many of the dreams as they could. As Figure 2 shows, they recalled many more of the prophecies that were fulfilled than those that were not. This result is hardly a surprise, of course, because the fulfillment of a prophecy reminds one of the original prediction, whereas a failure to fulfill it is often a non-event. The relevant outcomes are therefore inherently one-sided, and the confirmations are more easily recalled. The end result is that the broader belief in question—in this case, dream prophecy—receives spurious support.

The events relevant to psychic predictions are one-sided in another way as well. Psychic predictions are notoriously vague about when the prophesied events are supposed to occur. "A serious misfortune will befall a powerful leader" is a more common prophecy than "The President will be assassinated on March 15th." Such predictions are *temporally unfocused*, in that there is no specific moment to which interested parties are to direct their attention. For such predictions, confirmatory events are once again more likely to stand out because confirmations are more likely to prompt a recollection of the original prophecy. The events relevant to temporally unfocused expectations, then, tend to be one-sided, with the confirmations typically more salient and memorable than disconfirmations.

Temporally focused expectations, on the other hand, are those for which the timing of the decisive outcome is known in advance. If one expects a particular team to win the Super Bowl, for example, one knows precisely when that expectation will be confirmed or refuted—at the end of the game. As a result, the events relevant to temporally focused expectations tend to be two-sided because one's attention is focused on the decisive moment, and both outcomes are likely to be noticed and remembered.

In one study that examined the memory implications of temporally focused and unfocused expectations, participants were asked to read the diary of a student who, as part of an ESP experiment, was required to try to prophesy an otherwise unpredictable event every week for several weeks (Madey and Gilovich 1993). The diary included the student's weekly prophecy as well as various passages describing events from that week. There were two groups of participants in the experiment. In the *temporally unfocused* condition, the prophecies made no mention of when the prophesied event was likely to occur ("I have a feeling that I will get into an argument with my Psychology research group"). In the *temporally focused* condition, the prediction identified a precise day on which the event was to occur ("I have a feeling that I will get into an argument with my Psychology research group on Friday"). For each group, half of the prophecies were confirmed (e.g., "Our professor assigned us to research groups, and we immediately disagreed over our topic") and half were disconfirmed (e.g., "Our professor assigned us to research groups, and we immediately came to a unanimous decision on our topic"). Whether confirmed or disconfirmed, the relevant event was described in the diary entry for the day prophesied in the temporally focused condition. After reading the diary and completing a short distracter task, the participants were asked to recall as many prophecies and relevant events as they could.

Knowing when the prophesied events were likely to occur helped the respondents' memories, but only for those prophecies that were disconfirmed (see Figure 3). Confirmatory events were readily recalled whether temporally focused or not. Disconfirmations, on the other hand, were rarely recalled

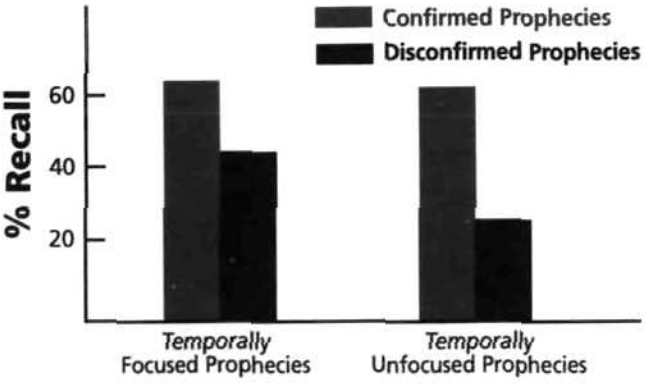

Figure 3. Participants' recall of prophecies that were confirmed or disconfirmed, as a function of whether or not the prophecies specified when the critical events were to occur. (Adapted from Madey and Gilovich 1993.)

unless they disconfirmed a temporally focused prediction. When one considers that most psychic predictions are temporally unfocused, the result, once again, is that the evidence for *psychic predictions can appear more substantial than it is.*

Conclusion

There is, of course, much more psychological research on the quality of everyday judgment than that reviewed here (see, for example, Baron 1988; Dawes 1988; Gilovich 1991; Nisbett and Ross 1980; Kahneman, Slovic, and Tversky 1982). But even this brief review is sufficient to make it clear that some of the reputed biases of everyday judgment turn out to be real, verifiable shortcomings. Systematic research by and large supports the suspicions of much of the skeptical community that everyday judgment is not to be trusted completely. At one level, this should not come as a surprise: It is precisely because everyday judgment cannot be trusted that the inferential safeguards known as the scientific method were developed. It is unfortunate that those safeguards are not more widely taught or more generally appreciated.

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The End of Science?

Why do many now view science as a failed ideology rather than as an epistemological ideal? Should science be viewed that way?

THEODORE SCHICK JR.

A little over six years ago, I attended the twenty-fifth annual Nobel conference, the only program outside of Sweden and Norway sanctioned by the Nobel Foundation. It was entitled, "The End of Science?" John Horgan, senior writer for *Scientific American*, has recently written a book of the same name (Horgan 1996). The subject of both of these inquiries is not the impending solution of certain scientific problems, but the impending dissolution of science itself. What prompted these projects is the growing belief that science is not the royal road to the truth. There is a view abroad in the land that science is more of an ideology than a methodology, and thus that it cannot legitimately claim to have a corner on reality. No one expresses this view more pugnaciously than the late philosopher of science Paul Feyerabend. He writes:

> Science is much closer to myth than a scientific philosophy is prepared to admit. It is one of the many forms of thought that

> have been developed by man, and not necessarily the best. It is conspicuous, noisy, and impudent, but it is inherently superior only for those who have already decided in favour of a certain ideology, or who have accepted it without ever having examined its advantages and its limits. And as the accepting and rejecting of ideologies should be left to the individual it follows that the separation of state and church must be complemented by the separation of state and science, that most recent, most aggressive, and most dogmatic religious institution. Such a separation may be our only chance to achieve a humanity we are capable of, but have never fully realized. (Feyerabend 1975, 295)

In Feyerabend's view, science is a religion, for it rests on certain dogmas that cannot be rationally justified. Thus, accepting it requires a leap of faith. But just as government has no business teaching religion in the public schools, it has no business teaching science either. In a truly democratic society, people would be as free to choose their epistemology as their political party.

The Nobel prize–winning physicist Sheldon Glashow spoke at the twenty-fifth Nobel conference in an attempt to counter these sorts of claims. His response consisted of the following "cosmic catechism": "We believe that the world is knowable, that there are simple rules governing the behavior of matter and the evolution of the universe . . . . [and that] [a]ny intelligent alien anywhere would have come upon the same logical system as we have to explain the structure of protons and the nature of supernovae. This statement I cannot prove, this statement I cannot justify. This is my faith" (Glashow 1989, 24). Instead of refuting Feyerabend, however, Glashow vindicated him. For he admitted that his belief in the objectivity of science is simply a matter of faith. It's no wonder that science's stock has fallen so precipitously in recent years.

Scientists' ignorance of the philosophical underpinnings of their enterprise has not gone unnoticed. In 1986, biology Nobelist Sir Peter Medawar commented:

> Ask a scientist what he conceives the scientific method to be, and he will adopt an expression that is at once solemn and shifty-eyed: solemn because he feels he ought to declare an opinion; shifty-eyed because he is wondering how to conceal the fact that he has no opinion to declare. (Quoted in Theocharis and Psimopoulos 1987, 595)

Scientists are a philosophically naive lot. But this naiveté does not come without a price. Because most scientists can't justify their methodology, Feyerabend's claims have gone largely unanswered. As a result, Feyerabend's position has become prominent in both academia and the public at large. This has arguably led not only to the rise of pseudoscience and religious fundamentalism, but also to a shrinking pool of scientific jobs and research funds. As physicists T. Theocharis and M. Psimopoulos lament in their article "Where Science Has Gone Wrong":

Feyerabend's position . . . has arguably led not only to the rise of pseudoscience and religious fundamentalism, but also to a shrinking pool of scientific jobs and research funds.

> Having lost their monopoly in the production of knowledge, scientists have also lost their privileged status in society. Thus the rewards to the creators of science's now ephemeral and disposable theories are currently being reduced to accord with their downgraded and devalued work, and with science's diminished ambitions. (Theocharis and Psimopoulos 1987, 595)

The rise of Feyerabend's view of science, they claim, is the "most fundamental and yet the least recognized cause" of the decline in science funding in the West. So don't let anyone tell you that philosophy has no practical import. If Theocharis and Psimopoulos are right, philosophy has put a number of scientists out of work.

Feyerabend once proclaimed that scientists "have more money, more authority, more sex appeal than they deserve, and the most stupid procedures and the most laughable results in their domain are surrounded with an aura of excellence. It is time to cut them down in size, and to give them a more modest position in society" (Feyerabend 1975, 304). It appears that he has done just that.

How did this happen? Why is science increasingly viewed as a failed ideology rather than as an epistemological ideal? Let's take a closer look at the arguments underlying Feyerabend's position.

Popper, Induction, and Falsifiability

Ironically, one of those most responsible for the diminished view of science is one who was firmly convinced of its superiority: Sir Karl Popper. Although Popper believed that scientific theories were better than nonscientific ones, he argued that the traditional inductive conception of science was mistaken.

According to inductivism, scientific method consists of three steps: (1) observe, (2) induce a hypothesis, (3) confirm the hypothesis through additional observations and tests. Popper objected to all three of these steps on the grounds that scientists do not—and cannot—follow them.

Popper found the notion that scientific inquiry begins with an observation ludicrous. He writes:

> Twenty-five years ago I tried to bring home the same point to a group of physics students in Vienna by beginning a lecture with the following instructions: "Take pencil and paper; care-

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> fully observe, and write down what you have observed!" They asked, of course, what I wanted them to observe. Clearly the instruction, "Observe!" is absurd. (It is not even idiomatic, unless the object of the transitive verb can be taken as understood.) Observation is always selective. It needs a chosen object, a definite task, an interest, a point of view, a problem. (Popper 1965, 46)

For Popper, a scientific investigation begins with a hypothesis. For without a hypothesis to guide research, scientists would have no way of distinguishing relevant from irrelevant data.

Popper also objected to the view that enumerative induction was used to generate scientific hypotheses. Many theories, such as the atomic theory, the genetic theory, and the gravitational theory, postulate entities or forces that are not mentioned in their data. Consequently, they cannot be arrived at through enumerative induction.

Scientists and educators alike need to realize that the educated person is not the person who can answer the questions, but the person who can question the answers.

Finally, he claimed, no universal generalization can be conclusively confirmed, for we can never be sure that we have examined all the relevant data. It is always possible that we will discover something that will overturn even the most well-established theory. Thus, he viewed science as the attempt to falsify rather than verify hypotheses. Besides, he thought, finding confirming instances of a theory is far too easy (Popper 1990, 104–10).

The most significant problem for inductivism, however, was first recognized by eighteenth-century empiricist David Hume. Hume noted that enumerative induction rests on the principle that the future will resemble the past. But this principle cannot be proven deductively, for it cannot be deduced from self-evident truths; and it cannot be proven inductively, for that would beg the question. So if science rests on induction, it rests on a dogma. And if it rests on a dogma, it is not a purely rational enterprise. So there may be more to Feyerabend's position than mere posturing.

By construing science as the attempt to falsify rather than verify hypotheses, Popper thought that he could avoid the problem of induction and distinguish real science from pseudoscience. The success of a test does not entail the truth of the hypothesis under investigation. But, he believed, the failure of a test does entail its falsity. So if science is viewed as a search for refutations rather than confirmations, the problem of induction drops out and the mark of a scientific theory becomes its ability to be refuted. Thus we have Popper's famous demarcation criterion: a theory is scientific if it is falsifiable. If there is no possible observation that would count against it, it is not scientific.

It was soon realized, however, that hypotheses can no more be conclusively falsified than they can be conclusively verified, for a hypothesis cannot be tested in isolation. Physicist-philosopher Pierre Duhem and logician Willard Van Orman Quine have convincingly demonstrated that hypotheses have testable consequences only in the context of certain background assumptions. If a test fails, it is always possible to maintain the hypothesis in question by rejecting one or more of the background assumptions.

Moreover, Popper's demarcation criterion is far too weak to distinguish science from pseudoscience. According to Popper, a theory is scientific as long as there is some possible state of affairs whose actual occurrence would refute the theory. By this criterion, however, astrology, creationism, and Immanuel Velikovsky's theory of planetary development would all be scientific theories, for they all imply propositions that could turn out to be false. Popper's demarcation criterion, therefore, lets in too much; it grants scientific status to theories that don't seem to deserve it.

Thus we have arrived at an impasse. We can't establish science's superiority by viewing it as an attempt to verify theories through induction, and we can't establish its superiority by viewing it as an attempt to falsify theories through deduction. Perhaps Feyerabend is right that there is no way to prove the superiority of science.

Kuhn, Paradigms, and Relativism

Philosopher of science Thomas Kuhn and Feyerabend argue that neither verification nor falsification can establish the objectivity of science because both assume that data are independent of theory. They claim, on the contrary, that all observation is theory-laden, for all perception involves conceptualization. Since each theory manufactures its own data, there is no neutral data that can be used to adjudicate among competing theories. As a result, theories are "incommensurable."

Kuhn and Feyerabend see science primarily as a puzzle-solving exercise. The rules for solving particular puzzles are contained in a "paradigm." A paradigm defines for scientists what sorts of puzzles are worth solving and what sorts of methods will solve them. From time to time, however, certain puzzles or "anomalies" arise that cannot be solved within the existing paradigm. When the cognitive dissonance created by these puzzles becomes too great, the scientific community undergoes a "paradigm shift." Kuhn describes the effects of a paradigm shift this way:

> Examining the record of past research from the vantage of contemporary historiography, the historian of science may be tempted to exclaim that when paradigms change, the world itself changes with them. Led by a new paradigm, scientists adopt new instruments and look in new places. Even more important, during revolutions scientists see new and different things when looking with familiar instruments in places they have looked before. It is rather as if the professional community had been suddenly transported to another planet where familiar objects are seen in a different light and are joined by unfamiliar ones as well. Of course, nothing of quite that sort does occur: there is no geographical transplantation; outside the laboratory everyday affairs usually continue as before. Nevertheless, paradigm changes do cause scientists to see the

> world of their research engagement differently. In so far as their only recourse to that world is through what they see and do, we may want to say that after a revolution scientists are responding to a different world. (Kuhn 1970, 111)

In Kuhn's view, scientists don't discover the nature of reality; they create it. There is no way the world is, for each paradigm makes its own world. It's easy to see why such views raise questions about the end of science. If there is no truth with a capital "T," then, of course, it makes no sense to say that scientists have a monopoly on it.

To determine whether we should we accept this view of science, we need to examine its implications.

If what we perceive is determined by the paradigm we accept, then it should be impossible to perceive anything that doesn't fit our paradigm. But if it's impossible to perceive anything that doesn't fit our paradigm, it's impossible for there to be any anomalies. And if it's impossible for there to be any anomalies, it's impossible for there to be any paradigm shifts. So if we accept Kuhn and Feyerabend's theory of perception, we must reject their history of science.

Moreover, recent neurophysiological research has shown that all perception does not involve conceptualization. Psychologist Edward Hundert explains:

> If someone loses the primary visual cortex (say, because of a tumor), they lose their vision; they go almost totally blind. But if they just lose the secondary or tertiary visual cortex, they manifest an unusual condition called visual agnosia. In this condition, visual acuity is normal (the person could correctly identify the orientation of the "E's" on an eye chart). But they lose the ability to identify, name, or match even simple objects in any part of their visual field. . . . This model can be translated into psychological terms as endorsing a functional distinction between "perception" (input analysis) and "cognition" (central processing). . . .
>
> It is easy to see the evolutionary advantage of this whole scheme, with its "upward" input analysis: if our transducers were hooked directly to our central systems, we would spend *most of our time seeing (hearing, etc.) the world the way we* remember, believe, or expect the world to be. The recognition of novelty—of unexpected stimuli—has extremely obvious evolutionary advantage, and is made possible only by the separation of transducers and central systems by "dumb" input analyzers. (Hundert 1987, 413, 420–21)

Neurophysiological research suggests that not all observation is theory-laden, for there are two types of observation: discrimination and recognition. Recognition may involve the use of concepts, but discrimination does not. For if it did, we could never perceive anything new.

Finally, if all research is conducted within a paradigm, then Kuhn's and Feyerabend's research itself must have been conducted within a paradigm. But if their research was conducted within a paradigm, its results cannot be considered to be universally true. We can say of Kuhn's findings, then, what Feyerabend says of science in general, namely, that "it is inherently superior only for those who have already decided in favour of a certain ideology." The proper response to a Kuhnian or a Feyerabendian, then, is the one that philosopher Alan Garfinkle gives to the relativists in his philosophy classes: "You may not be coming from where I'm coming from, but I know relativism isn't true for me" (quoted in Putnam 1981, 119).

Much more could be said on this topic. But it's important to realize that scientists need not recite a catechism when faced with claims of the sort made by Kuhn and Feyerabend.

Science, Justification, and Belief

Can science be shown to be a superior means of acquiring knowledge? Yes it can, but only by showing that it is more likely to yield justified beliefs than any other methodology. Thus the real issue is not whether a belief is scientific or pseudoscientific but whether it is justified or unjustified.

We are justified in believing something to be true when it provides the best explanation of the evidence. Science is superior to other methods of inquiry because it usually provides better explanations than they do. The goodness of an explanation is determined by the amount of understanding it produces, and the amount of understanding an explanation produces is determined by how much it systematizes and unifies our knowledge. The extent to which an explanation does this can be determined by appealing to various criteria of adequacy such as simplicity, scope, conservatism, and fruitfulness. No one wants to hold unjustified beliefs. The problem is that most *people never learn the difference between a good explanation* and a bad one. Consequently they come to believe all sorts of weird things for no good reason.

Must science come to an end? Not necessarily. But unless scientists become more philosophically sophisticated, their apologetics will continue to ring hollow. And unless our educational system focuses more on teaching students how to think than on what to think, our populace will become increasingly credulous. Scientists and educators alike need to realize that the educated person is not the person who can answer the questions, but the person who can question the answers. In our age of rapidly changing information, knowing how to distinguish truth from falsity is more important than knowing what was once considered true and false. Only a person who knows the difference between a justified and an unjustified belief can truly appreciate the value of scientific inquiry.

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The Book of Predictions: Fifteen Years Later

It is now possible to verify the accuracy of the first fifteen years of predictions in this popular book.

ALAN M. TUERKHEIMER and STUART A. VYSE

In newspaper and magazine articles and on various news and entertainment television programs, authorities, experts, and psychics speculate about the future, but when the future comes, we rarely recall these predictions and assess their accuracy. *The Book of Predictions* provides an excellent opportunity to do just that. In 1981, best-selling novelist Irving Wallace and his children, Amy Wallace and David Wallechinsky, published *The Book of Predictions.* The senior Wallace, who died in 1990, had previously written sixteen novels and seventeen works of nonfiction with worldwide sales of 145 million copies. Both Wallace's daughter and son were successful writers in their own right, and the trio had recently collaborated on *The People's Almanac* (1981), which included a few predictions. A number of readers expressed interest in this section of the book,

and, as a result, the Wallaces undertook a separate volume comprised entirely of predictions. Amy Wallace was particularly suited to this task. She had "graduated" from the Berkeley Psychic Institute (a school where six-week classes are offered to help people nurture their psychic abilities) and was said to have developed such skills as clairvoyant reading and psychic healing.

To collect material for their book, the Wallaces consulted experts in a variety of fields. For example, Dr. Willard Libby, who received the Nobel Prize for chemistry in 1960, contributed to the volume, as did Ashley Montagu, the British anthropologist and social biologist. In addition, chapter 9 was devoted to predictions solicited from seven professional psychics, or "seers," as the Wallaces called them. Because each prediction was identified by the year it was supposed to occur, it is now possible to verify the first fifteen years of predictions. Thus, to test the accuracy of professional psychics, we checked all the predictions made in chapter 9 of *The Book of Predictions*—a total of ninety-three predictions. The psychics whose prognostications the Wallaces published included Dennis Conkin, Francie Steiger, Bertie Catchings, Ann Fisher, Beverly Jaegers, Andrew Reiss, and Alan Vaughn. Finally, to provide a comparison group, we selected an equal number of experts from other fields, including Libby, Montagu, computer scientist Edmund Berkeley, scientist and warfare engineer Eldon Byrd, Catholic priest and professor of sociology Andrew Greeley, science fiction author and professor of biochemistry Isaac Asimov, and life-styles editor of *The Futurist* magazine David Snyder.

We developed the following methods for evaluating the psychics and experts. If a prediction was relatively unambiguous, it was scored either a "hit" or a "miss" based on the available evidence. However, many of the predictions were vague or contained several parts. Thus, when a portion of a larger prediction was correct, but the remainder was wrong or could not be verified, it was scored a "partial hit." For example, Ashley Montagu predicted an increase in church-going but a decline in religion and in the quality of spiritual values. An increase in church attendance can be established, but it is impossible to objectively assess a decline in religion or in the quality of spiritual values. In addition, when a prediction was correct but the event happened after the time it was supposed to have occurred, it was scored a "partial hit." These are fairly lenient criteria for judging predictions, but given the difficulty of the task, we felt they were fair.

Our study produced two important findings. First, as Table 1 illustrates, neither experts nor psychics were able to predict the future with any degree of accuracy. Second, although they were not particularly impressive visionaries, the experts fared better than the psychics. They tended to make fewer predictions[1] (an average of 7.3 each for the experts versus 13.3 for the psychics) and had a higher percentage of hits (16% versus 6%), although this difference was not statistically significant. However, when hits and partial hits were considered, the experts were more than twice as accurate as the psychics (35% versus 14%), a difference that was statistically significant.[2] Table 1 also shows the results for each individual psychic and expert in the study. Two of the contributors showed zero accuracy rates, one psychic (Francie Steiger) and one expert (Isaac Asimov). The highest accuracy level was obtained by anthropologist Ashley Montagu with a score of 40 percent for hits and 60 percent for hits plus partial hits.

In addition to fascinating people with the purported ability to predict the future, psychics have a secondary interest in dazzling the faithful with outlandish, futuristic, and improbable prophecies.

An example of a hit credited to one of the psychics was Bertie Catchings' prediction that by 1985 a bloody conflict would erupt between India and Pakistan. However, she was not correct when she predicted that by 1992 an underground railroad tunnel would connect Dallas and Chicago. Engineer Eldon Byrd was correct in predicting that the Soviets would ultimately cease to be a world power, but Dr. Libby was not correct in predicting that by 1990 long-range weather prediction would be accurate.

A partial explanation of the experts' greater accuracy can be found in the nature of their predictions. In general, the experts were more conservative—making fewer predictions and restricting the predictions they made to their specific fields of knowledge. For example, computer scientist Edmund C. Berkeley's predictions were limited to the role of computers in the future. In contrast, the psychics, who had no specific areas of expertise, often made fantastic predictions about events in a wide range of fields, including science, politics, and entertainment. For example, Bertie Catchings thought that by 1992 several satellite stations, floating above major cities, would change solar energy into microwaves which would be beamed back to Earth for conversion into electric power. This pattern suggests that, in addition to fascinating people with the purported ability to predict the future, psychics have a secondary interest in dazzling the faithful with outlandish, futuristic, and improbable prophecies.

The psychics in *The Book of Predictions* also show a bias toward foretelling good news. For example, Beverly Jaegers predicted that sometime between 1984 and 1986 virtually all cancers would be instantly arrested, cured, and eventually eliminated through a reprogramming of DNA. Similarly, Francie Steiger suggested that by 1993 auto repairs would be eliminated when a substance called "memory metal" was invented that could pop back to its normal shape when dents and bends

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were simply heated. Unfortunately, the desire to create excitement in the present with tales of a spectacular and generally happy future makes it less likely that psychic predictions will come true when the future actually arrives. As a result, professional psychics survive on the hope that few of those who seek their services will bother to check their accuracy.

Evidence that unskilled professional psychics can be financially successful comes from the discovery that several of the psychics from *The Book of Predictions* are still practicing and are thought—by some, at least—to be quite gifted. Ann Fisher, who had an accuracy rate of 25 percent in this study, has been working in Montreal for the past twenty years. She makes her living by doing hypnosis, interpreting astrology charts, and giving forty-dollar-per-hour consultations (*The Gazette* [Montreal], August 1, 1994). Alan Vaughn works at SRI International and is described by many as "the best predictor available today" (*The Evening Standard* [London], June 20, 1994). Bertie Catchings continues to work as a psychic in the Dallas–Ft. Worth area and has been described by *The Dallas Morning News* (July 12, 1993) as "the best in the business." A search of several databases failed to produce any current references to the other psychics consulted by the Wallaces. We can only hope that they have gone on to professions for which they are better suited.

Professional psychics survive on the hope that few of those who seek their services will bother to check their accuracy.

Our results are consistent with previous investigations of the accuracy of psychic predictions. For example, once a year science writer C. Eugene Emery Jr. publishes an assessment of tabloid psychics (see his assessment for 1996, "What? I Don't Remember That!" SKEPTICAL INQUIRER, January/February 1997). Emery, who has been collecting tabloids since around 1980, has said, "When it comes to forecasting unexpected events, psychics historically have had an abysmal track record" ("Psychics Fail Once Again," *Skeptical Briefs*, December 1994). Often psychics' reputations seem to be made on the basis of a single dramatic prediction. For example, Jeane Dixon is credited with having foretold President John F. Kennedy's assassination. In fact, she merely employed the well-known twenty-year death cycle—from 1840 to the time of her prediction, every president elected to office in an even-decade year (e.g., 1960) died in office.[3] Furthermore, although in 1953 Dixon did predict that a blue-eyed Democratic president (unnamed) elected in 1960 would die in office, by the time 1960 arrived she predicted the victory that year not of Kennedy but of Richard Nixon, a Republican (Bringle 1970, 35). So she had made contradictory predictions, not unusual in the psychic trade. Dixon's overall batting average is extremely low, and our examination of *The Book of Predictions* suggests that her performance is typical of professional psychics.

Perhaps the best response to those who claim they can foretell the future was exemplified by Emery himself. In January of 1994 the tabloid psychics made their usual forecasts for the coming year. Among them were predictions that an earthquake would turn Florida into an island, Michael Jackson would become an evangelist, and thousands would die in South Carolina at the hands of a teenager who would accidentally detonate a homemade nuclear bomb in his basement ("Headlines That Didn't Happen," SKEPTICAL INQUIRER, Spring 1994). When asked to comment on these predictions, Emery said, "I predict that it won't happen."

TABLE 1

Accuracy of predictions made by psychics and experts in ***The Book of Predictions*** for the years 1981-1996

		No. of Predictions	Hits	Hits + Partial Hits	Percentage Hits + Partial Hits
PSYCHICS	Bertie Catchings	20	2	3	15%
	Dennis Conkin	13	3	3	23%
	Ann Fisher	4	0	1	25%
	Beverly Jaegers	17	0	3	18%
	Andrew Reiss	7	0	2	29%
	Francie Steiger	20	0	0	0%
	Alan Vaughn	12	1	1	8%
	Totals	**93**	**6(6%)**	**13**	**14%**
EXPERTS	Isaac Asimov	3	0	0	0%
	Edmund Berkeley	8	0	2	25%
	Eldon Byrd	6	1	3	50%
	Andrew Greeley	6	1	3	50%
	Willard Libby	8	0	2	25%
	Ashley Montagu	5	2	3	60%
	David Snyder	15	4	6	40%
	Totals	**51**	**8(16%)**	**18**	**35%**

Notes

The authors would like to express their gratitude to David Albert, Jeffrey Kosokoff, and the members of the Connecticut College Behavior Analysis Research Group for their suggestions and contributions to this project. Special thanks go to Christopher J. Bailey, Leigh Ann Kimes, and Stephen C. Scherer.

1. $t(12) = 2.18$, $p < .06$.

2. $\chi^2(1, N = 144) = 9.58$, $p < .01$.

3. Ronald Reagan's survival of two full terms in office ended the twenty-year cycle. He was first elected to office in 1980.

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A Real Cool Con

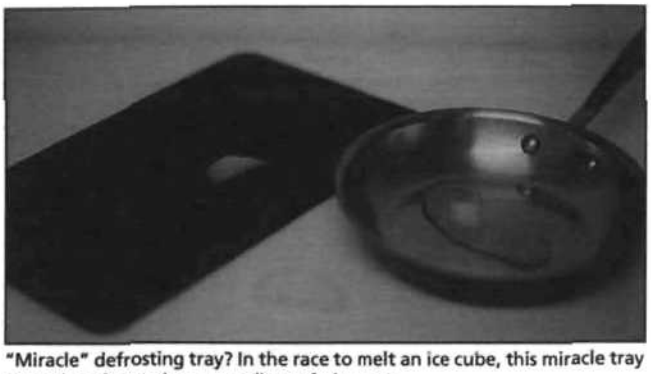
Those defrosting trays that thaw frozen foods by "taking heat directly out of the air" are equally adept at taking money directly out of your pocket.

ROBERT L. WOLKE

Several brands of "miracle defrosting trays" are being sold on cable television and in cookware stores. The advertising asserts that they defrost frozen foods in record time by taking heat directly out of the air without the use of batteries or any other source of energy.

This strikes the naive listener as quite a remarkable feat, somewhat akin to the psychic's ability to tune into the "cosmic energy" that is presumably free for the taking by those in the know. It is also reminiscent of those "experiments" that purport to show how tomato plants grown beneath strung-out copper wires wax larger and healthier because they take electrical energy directly out of the air. (Exactly what electrical energy is doing in the air and why it should make bigger tomatoes are never discussed.)

But taking heat out of the air is, of course, no trick at all. Because heat flows from higher to lower temperatures, anything that is the least bit cooler than the surrounding air will automatically "take heat out of the air." Whether it is actively



"Miracle" defrosting tray? In the race to melt an ice cube, this miracle tray proved no faster than an ordinary frying pan.

taking the heat or simply accepting it is only a matter of semantics.

I bought one of those defrosting trays because I thought I knew what was going on and wanted to confirm my suspicions. (I later returned it and got my money back.)

By chemical and density tests, I quickly determined that this "miraculous, all-natural" device, made of "an advanced, space-age super conductive [*sic*] alloy," would be more aptly described as a slab of cast aluminum, anodized black to look more impressive. Aluminum is worth about seventy cents a pound, but you'll pay ten to twenty dollars for about two pounds of it in the form of this "natural miracle" defrosting tray.

The idea is that you put your frozen food on the slab and the food thaws faster than you can say "plus shipping and handling." But when you read the instructions inside the package, you learn that you should "condition" the tray by running hot water over it for a minute or so before using it each time, and again halfway through the thawing process. One might say that it miraculously takes heat directly out of your hot water.

But what amazes many people, and even me when I saw it, is the astounding demonstration that the tray hucksters show on television and challenge you to try at home: Put one ice cube on the defrosting tray and another one on the kitchen counter beside it, and lo and behold! The one on the tray melts quickly before your eyes, while the one on the counter just sits there looking embarrassed. It really works. I tried it.

What's going on? Well, metals are the best conductors of heat among all materials. So if you put an ice cube on a thick plate of metal—almost any metal—the metal will efficiently conduct heat from the relatively warm room air into the cold ice, which will then dutifully melt in a relatively brief period of time. The tray promoters are well aware that most kitchen counters are made of plastic laminate, wood, or tile—materials that are such terrible heat conductors that they can actually be used as insulators. So ice on a countertop won't melt nearly as fast as it will on an efficient heat conductor. To check this, I placed one ice cube on the miracle tray and another one on a heavy aluminum frying pan right beside it. The cubes melted in exactly the same amount of time.

The moral of the story is that unless you're willing to risk heating your frozen food in a microwave oven, which can degrade its texture and might even begin to cook it, the fastest and cheapest way to thaw it is to place it on an unheated, heavy frying pan. Try it with an ice cube; you'll be amazed at how fast it melts. Frying pans are deliberately made to be efficient conductors of heat, so almost any heavy pan will work well. (A thick pan can obviously conduct more heat per second than a thin one can.)

A copper pan is best, followed by aluminum and then by copper- or aluminum-clad stainless steel. Iron pans, however, are relatively poor conductors; they are prized for holding their heat, once heated. Flat pieces of frozen food, such as steaks and chops, will make the best thermal contact with the metal and will therefore thaw fastest. Ice cubes, of course, make excellent thermal contact through their quickly developed puddles.

Incidentally, the slowest way to thaw frozen food is to leave it out in the air, because air is just about the worst heat conductor around—even worse than a countertop. Water is quite a bit better than air, though not as good as metal. If the food is in a tight (no air spaces), waterproof wrapper, soaking it in cold tap water will be a lot faster than leaving it out in the air, in spite of the fact that the temperature of the air may be 70 degrees Fahrenheit and that of the water may be only 55 or 60 degrees.

This phenomenon makes a good bar bet. Bet someone that you can thaw a box of frozen strawberries faster at 60 degrees Fahrenheit than at 70 degrees. □

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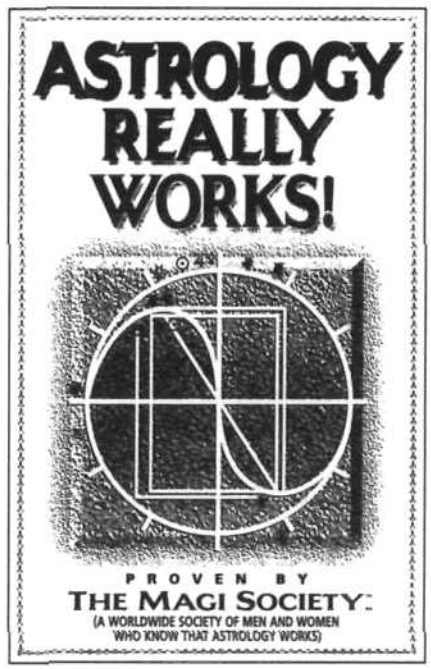
Crooked Thinking Is Alive and Well

GEOFFREY DEAN

Astrology Really Works! By the Magi Society. Hay House, Carson, California, 1995. ISBN 1-56170-134-3. 327 pp. Softcover, $12.95.

This is a strange book. It claims to present irrefutable evidence that astrology really works, so we might expect it to cite some of the many hundreds of published research studies. Not this one. There is no reference to any astrologer, article, book, or published research. The name Gauquelin is nowhere mentioned. The authors are identified only as the Magi Society, "an international association of men and women who know that astrology works" (p. 318), contactable only via a New York telephone number, (212) 867-2905 (p. 61). There is a glossary and more than 120 birth charts, but no index, so abandon all hope of easy retrieval.

It gets even stranger. The text includes scientist-bashing ("no one outside of their own circle is allowed to evaluate or criticize their conclusions," p. 227), astrologer-bashing ("there are only a handful of legitimate astrologers in the whole world," p. 317), fundamentalism ("the fact that astrology works . . . will be the closest thing to proof of God," p. 240), and astro-creationism ("astrology proves that the fittest are not those who have the best genes, but they are those who have the most favorable astrological aspects in their natal charts," p. 219). This may explain why, right from the start, the text reads like a sermon, complete with breathtaking self-assurance: "After researching the birth charts of all the most successful men and women in America, we found that astrology



unquestionably works. But of course, we, of the Magi Society, knew that all along due to our extraordinary and unsurpassed knowledge of astrology, which we call Magi Astrology" (p. 1).

Strangely, their extraordinary and unsurpassed knowledge is not without error. Aspects (specified angular separations) were not used four thousand years ago (p. 10), Newton was not an astrologer (p. 16), astrologers do not try to avoid using aspects (p. 41), signs were not formulated thousands of years ago (p. 131), and Darwinists do not claim we evolved from apes (p. 225). But I digress.

The Magi explain that "astrologers and others have made many failed attempts to prove that astrology works" (p. 37), so "we decided that astrology, as it was generally practiced and understood by the average astrologer in 1994, was not yet solid enough to be proven." In other words, it needed its own Newtonian revolution "before it could be proven and accepted by most of its critics" (p. 39). To make a breakthrough it needed a breakthrough. Therefore "we will take astrology the necessary monumental giant leap ahead by adding a whole new dimension to it; by doing so, astrology becomes provable" (p. 39).

The Magi's monumental giant leap consists of (1) tossing out all birth data except the date, and (2) tossing out all chart factors except interplanetary aspects, parallels, and contra-parallels. A parallel or contra-parallel exists if two planets have the same or opposite declination (angular distance from the celestial equator), respectively. Astrologers who insist that birth times are essential, and that only the whole chart may be used, might well feel compromised. Indeed, on this basis the Magi would fail the elementary exam of most astrological teaching bodies. Declination is the supposed "new dimension," even though it has been used by many astrologers from Ptolemy onwards, albeit with much disagreement over its utility. My own survey of more than one hundred astrological sources found that

user opinions were divided roughly 2 to 1 in favor of its being unimportant. A Magi birth chart (one is shown on the cover) has planetary declinations in the area traditionally reserved for houses.

The justifications for this giant leap are revealing. Birth times are out because "even birth certificates that have exact times are almost always wrong" (p. 40, how can they know this?). Declinations are in because "it is impossible to fully interpret birth charts without them" (p. 58, most astrologers do it all the time). This is like arguing that, because wheel alignment is never absolutely exact, cars can do without wheels but not cigarette lighters. Furthermore, because popular ephemerides (tables of planetary positions) do not show declinations, be sure to buy the Magi's one, available from Hay House (p. 53), or their software package (p. 151). Of course, even in the 327 pages of the present book, there is a limit to what can be said, so "in the future we will be publishing more books" (p. 295), at which point the commercial advantages of promoting an astrology dependent only on date and your own publications will be apparent.

Having taken this giant leap, the Magi then proceed to prove astrology by various observations. Along the way, they give particular aspects capitalized names to indicate their connections. The super rich and famous (e.g., Rupert Murdoch, Clint Eastwood) "almost always have at least one, and on the average, two to three" of twelve Super Aspects so powerful that "anyone who possesses even one of these aspects has a jump start on achieving great success" (p. 67). The average champion athlete has two Super Aspects plus two of seventeen Sports Champion Aspects (p. 205). The difference between Sports Champion Aspects and Super Aspects is complicated and confusing (seven aspects are common to both), but in broad terms the former involve Mars and the latter do not. Among other things, planetary aspects affect the stock market (p. 113), the success of companies (p. 245), personal relationships (p. 271), and business opportunities (p. 293). Positions midway between planets in celestial longitude or in declination behave like planets and are just as important (p. 147).

Unfortunately these observations are presented uncritically without controls or statistical tests, that is, in a manner that will be drearily familiar to readers of astrology books. Nevertheless the Magi assure us that everything has been subjected to "rigorous scientific statistical tests," the details being conveniently omitted because they are "beyond the interest level of most of our readers" (p. 304), which I suppose is an interesting commentary on their target audience. However, "anyone who wishes to obtain the study can contact us," although just asking for it implies "a very deep-rooted skepticism of astrology. In such a case no amount of statistical validation may be enough" (p. 305).

At this point, astrologers and skeptics alike might justifiably view the Magi's observations as being better suited to the *National Enquirer*. But what makes the Magi's book worth at least passing attention is that their observations are restated as Six Challenges To Skeptics. To my knowledge, no other astrology book has challenged skeptics so directly. "Astrology really works and is proven unless the skeptics can meet all of our challenges" (p. 317), which at first sight seems fair enough.

Two of the six challenges involve predicting the future, and are discussed later. The rest are as follows:

- List famous, long-established athletes who do not have a Neptune enhancement of the Sun. The Magi will list those who do. You lose if your list is not ten times longer than their list (p. 61).
- List American sports champions who have no Sports Champion Aspect and not more than one Super Aspect. The Magi will list those who have at least one of each. You lose if your list is shorter than theirs (p. 206).
- Choose a number of two-year-old horses who have no Sports Champion Aspect, no multiple aspect involving Mars, not more than one Super Aspect (here the choice is limited to nine), and who have not raced. The Magi will choose an equal number who have at least one Sports Champion Aspect or at least two Super Aspects. You lose if your horses win less money than theirs during the next two years (p. 221).
- List successful corporations with no Super Aspects in their charts. The Magi will list those with at least two. You lose if your list is shorter than theirs. "If skeptics do not meet this challenge, we have the right to say that astrology is proven" (p. 246).

The middle two challenges are immediately ambiguous because the Magi do not explain how to deal with those Sports Champion Aspects that are also Super Aspects. That aside, the twelve Super Aspects (p. 68) and eleven of the seventeen Sports Champion Aspects (pp. 204–205) are all "enhancements." An enhancement exists when two planets are mutually in conjunction aspect (0° angular separation), or in trine aspect (120°), or in parallel, or in contra-parallel. The orb (permissible inexactness) is 2°30', or 3° for the aspects (pp. 52, 71).

The orb is crucial because it determines the probability of occurrence. For a parallel or contra-parallel, the probability also depends on where the planets are in their orbits because, like a person on a swing, each spends more time at the extremes of declination than at the mid-

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point, which of course increases the probability of occurrence. The probability will also depend on retrogradation (the apparent reversal of planetary motion as seen from the earth, which increases the time spent at whatever declination the planet happens to be at), and on planetary latitude (which shifts declination up or down as a whole). In short there are so many complications that controls are essential. But as a guide, my computations indicate that the long-term probability of an enhancement is something like 0.26, most of which is due to the declination component. So, with twelve enhancements to choose from, the average chart will contain about $12 \times 0.26 = 3.1$ enhancements purely by chance. The Magi's observed average of two or three for the rich and famous is therefore unremarkable. More to the point, their first challenge is unwinnable—if the total population of famous athletes is N, then purely by chance (irrespective of any astrology) the Magi will find $0.26N$ with an enhancement, leaving us to find $2.6N$ with none, which is impossible. It would be easier to toss coins and always get heads.

In the other challenges (ignoring ambiguities) we basically need to find cases with no enhancements while the Magi need to find cases with at least two. For the twelve Super Aspect enhancements, the probability of finding none will depend on the time period, but will generally be something like $(1 - 0.26)^{12} = 0.027$, whereas the probability of finding at least two, calculated binomially, comes to 0.86. In fact, the Magi later include a handful of other aspects as Super Aspects (p. 142), so the above difference in probabilities is conservative. Similar probabilities apply to the seventeen Sports Champion Aspects. If, as in the ambiguous cases, we are allowed no Sports Champion Aspects *and* not more than one Super Aspect, then the probability of 0.027 becomes even smaller; but for simplicity I will ignore this.

So what do these probabilities tell us? As before, if the total population of cases is N, then whether we count corporations or cats, we will find around $0.027N$ cases with no enhancements. But purely by chance, the Magi will find around $0.86N$ cases with at least two enhancements, or over thirty times as many. This means that the Magi will have over thirty times as many horses to choose from and a correspondingly better chance of picking winners. It also means that we cannot possibly exceed the Magi's count of $0.86N$ because only $0.14N$ non-Magi cases remain. In other words the corresponding challenges are unwinnable. Or, as the Magi Society says, it "has examined the birth charts of EVERY superstar of American sports, and we know skeptics cannot meet this challenge" (p. 206). The skeptics' failure to win will, of course, have nothing to do with astrology and everything to do with statistical probability. In effect, the deck is stacked absolutely in the Magi's favor, which did not stop a reviewer in the *Astrological Journal* (1996, 38: 263–264) from concluding that the Magi's evidence is "certainly persuasive."

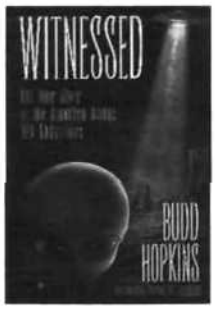
The Magi generously offer to reduce the orbs to 2°20' and 1°50' for aspects and declination, respectively, thus supposedly making success "harder for the Magi . . . and . . . easier for skeptics" (p. 312). This increases our count to around $0.06N$, but reduces theirs only slightly to around $0.76N$, so the deck is still stacked absolutely in their favor. In effect, skeptics are being challenged, not to show that butchers differ astrologically from bakers, but to show that butchers tend not to have two arms and two legs. Note the irony: even if this were possible, it would say nothing about astrology.

The remaining two challenges involve predicting the future by transits and progressions (future planetary positions judged in relation to birth positions):

- Make money on publicly traded stocks and commodities (no real estate) by investing on days when, by Magi rules, there are bad transits to your birth chart. "The Magi Society will tell you when you cannot make money. Contact us and we will prove it" (p. 123).
- Choose any well-known group of American athletes and predict their performance over the next few years better than the Magi Society. You cannot choose athletes who have favorable transits and progressions according to Magi rules. "We are very anxious to compete with skeptics on this challenge. Please do not disappoint us" (p. 129).

The first requires actual investment, not pretend investment, so you will need plenty of spare money. But in both cases, there is a severe problem, because "until you read one of our subsequent books, you will not know how to correctly evaluate your transits and progressions" (p. 272). This means we cannot make any probability calculations or check what the Magi Society tells us. In the absence of this essential information, there is no reason to suppose that either challenge is more soundly based, or less stacked, than the others. No sensible person will bother.

So what might skeptics conclude? Does astrology really work? "After they have read this book, only those skeptics who want to be unreasonable and do not want to accept the truth will continue to refute the validity of astrology. We know that they cannot meet our challenges. Nonetheless, we expect to be attacked and vilified by the most diehard of skeptics. What we have written will be misrepresented, taken out of context, and nitpicked" (p. 316). Well, maybe. But whatever our opinion of astrology, unbelievable books like this can only make it worse. Until the Magi abandon their sermons, stacked decks, and naive counting, in favor of scholarship, controlled studies, and adequate reporting, their "irrefutable evidence" for astrology is evidence only that crooked thinking is alive and well. Gullibility really works! □



A Bridge Too Far

JEFFREY B. KING

Witnessed: The True Story of the Brooklyn Bridge UFO Abductions. By Budd Hopkins. Pocket Books, New York, 1996. ISBN 0-671-56915-5. 399 pp. Hardcover, $23.

In his *Witnessed: The True Story of the Brooklyn Bridge UFO Abductions*, artist and UFO investigator Budd Hopkins presents his third book recounting stories of people who claim that aliens from outer space abducted them and conducted medical and breeding experiments on them. The book focuses on the travails of one women, Linda "Cortile" (a pseudonym), at the hands of both alien and human tormentors. While the author boasts that this story proves that "powerful, nonhuman intelligences have long been at work on a covert agenda involving thousands upon thousands of traumatized men, women and children," the case is as weak, if not weaker, than those he has presented before and so hardly supplies such proof.

As is well known to SKEPTICAL INQUIRER readers, critics of alien abduction claims have raised numerous problems with them (most tellingly in a NOVA special broadcast on PBS in February 1996), including the questionable reliability of hypnotically enhanced memory, the lack of physical evidence, and the similarity of many such stories to known sleep disorders. The most notable criticism, however, is the lack of third-party witnesses to any of the supposedly thousands (or even millions) of abductions allegedly occurring each year in the United States alone. With *Witnessed*, Hopkins believes he has now presented the case that will end such criticisms.

The supposedly witnessed abduction of Linda occurred around 3:15 A.M., November 30, 1989, five months after Linda first contacted Hopkins (after she read his popular second book, *Intruders*) and began attending one of his abductee support groups. The day after the incident, Linda reported to Hopkins that she saw a strange figure in her bedroom. The details came out in a hypnosis session held several days later: Linda was floated out through the closed window of her high-rise apartment and into a brightly lit UFO hovering outside.[1] Hopkins reports that at this time the only unusual part of Linda's experience was a verbal exchange she held with the aliens aboard their ship, apparently in their tongue: "NOBBYEGG." "NO KAVE. KAVE." "NOBBYEGG." "NO. KAVE." Because it was otherwise so typical, Hopkins filed Linda's story away, where "it was nearly forgotten in the torrent of subsequent cases."

Then in February 1991, he received a letter signed by two men who, using only the first names "Richard" and "Dan" (also pseudonyms), claimed to be police officers who witnessed Linda's abduction from their police car, which had stalled near the Brooklyn Bridge. Richard and Dan stated they did not know if Linda was still alive, and they felt they had to contact someone to relate their experience from fifteen months before. Richard and Dan later contacted Linda at her apartment, without needing instructions from Hopkins on how to reach her.[2]

After Hopkins' and Linda's checks with the New York Police Department raised questions about whether Richard and Dan were really police officers, Richard and Dan wrote to Hopkins to admit that they were really security officers who had been guarding a VIP, and that the VIP also observed the abduction that night. Later, the story develops that all three of these men were kidnapped as well and transported to a beach where they watched Linda (identified by the aliens as "The Lady of the Sands") dig sand samples with several aliens. Part of the ludicrous proof for this bizarre scene is Richard's claim that he and Dan had to help the sand-covered VIP off the roof of their car after the encounter was over. Seemingly, the aliens were too inept to return the important passenger to the interior of the car and instead just dropped him onto the roof. While Hopkins refuses to identify this VIP in his book, calling him simply "The Third Man," as early as 1992 several UFO newsletters and many mainstream magazines and newspapers revealed that he is allegedly Javier Perez de Cuellar, then Secretary-General of the United Nations. It should come as no surprise that neither the former Secretary-General nor the United Nations has any memory or record of his car having stalled at that time or place, much less of an alien kidnapping.

Other "witnesses" soon followed. Several months after Richard and Dan's first letter, "Janet Kimball" wrote Hopkins saying she too observed the abduction when her car, along with many others, stalled on the Brooklyn Bridge. In her letter to Hopkins, Janet describes the other people on the bridge screaming in terror at the sight of the UFO. This was followed in 1993 by telephone conversations with a man named Frank Turner (his real name), who had been researching the then public Linda case and whose aunt, Cathy Turner, claimed to have seen a bright red UFO over a building in New York, but no abduction. Cathy Turner could not remember the exact year or month she saw the UFO (only that it was after 1988) or exactly what bridge she was on when she saw it. In fact, even Hopkins admits that her first guess that she was on the Brooklyn Bridge would have put her facing in the wrong direction to have seen Linda's UFO, so Hopkins decides she was really on the elevated FDR drive.

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With further similar "corrections" to Cathy Turner's scanty report, Hopkins convinces himself that it provides corroboration for Linda's case.

Linda's story doesn't end with mere alien abductions, however. In addition to her problems with extraterrestrial kidnappers, Linda has also been abducted off the streets of New York several times by Richard and Dan, with Dan, apparently obsessed with Linda, attempting on one occasion to drown her. Linda was even hit by a car while being chased by Dan through Manhattan, though unfortunately no accident report or witness to this incident is ever mentioned. Indeed, the sole evidence for these human abductions is a set of photographs of Linda running on a beach,[3] an alleged tape recording of Linda and Dan, and the testimony of a bodyguard (provided by Hopkins) who says he saw the grey surveillance van that supposedly is driven by accomplices of Richard and Dan and follows Linda about, though even he admits that there is no real evidence that the van has any connection to Linda. Not surprisingly, with such "evidence" Linda has never reported these crimes to the police or any other investigative agency.

There are many fundamental problems with the story of Linda's abductions (by aliens and humans), leaving many troubling, unanswered (or unsatisfactorily answered) questions. How, for example, did Richard, Dan, and Janet Kimball know to contact Hopkins, since at the time, the case was on Hopkins' backburner and no one had publicized his involvement in the case? Why didn't any of those other people stalled on the Brooklyn Bridge report this amazing incident? Indeed, why didn't any of the other people who were surely on the streets at that hour in ever busy New York (including drivers going to and from the *New York Post*'s nearby loading dock) or the twenty-four-hour security guards from Linda's apartment building report this blindingly bright UFO? Richard, in fact, claims that he, Dan, and the "Third Man" were not alone but were accompanied by fifteen other people, including "[t]wo U.S. government officials, two foreign Statesmen, [and] one World Leader." Who were these people? Is there any proof of their witnessing this amazing event or of at least having suffered a delayed transit on November 30, 1989? Hopkins either ignores such questions or provides airy dismissals or silly solutions. For example, as one explanation for the lack of other witnesses, Hopkins says the aliens used their power to make themselves selectively invisible or to selectively "switch off" the consciousness of witnesses. Then why didn't they use complete invisibility or "switching off" to avoid all witnesses? Hopkins speculates that the whole abduction was "an overt attempt to affect the thinking of governments worldwide." Then why not directly contact various governments or at least stage the event for maximum exposure instead of in the earliest hours of the day using partial invisibility or "switching off"?

The ultimate problem with *Witnessed*, however, is that Hopkins' claim of independent witnesses proves to be unsupported. Magazine and newspaper articles report that Perez de Cuellar has denied several times that he ever witnessed any such occurrence.[4] As for the two prime witnesses, Richard and Dan, no one other than Linda and members of her family have ever met them, nor has any independent confirmation been found to prove they even exist. Hopkins' only contact with them is through anonymous letters and tapes mailed to him or provided by Linda. While Hopkins did meet Cathy Turner and speak to her on the telephone, Hopkins also reports she died in 1994, so unless an able psychic is available, her testimony will be hard to obtain. Hopkins also met Janet Kimball (once), but *Omni* magazine reported in 1994 that shortly thereafter she refused to discuss the case further, even with Hopkins. *Saucer Smear*, a popular UFO newsletter, further reports that Janet Kimball has also died (requiring even more contact with the beyond to find confirmation of Linda's story). As it finally develops, *Witnessed* provides no confirmed, independent witness for its story, and so the very fact that is supposed to make this book the final proof that alien abductions are real events proves to be illusory.

Evidently realizing that he has a problem, Hopkins tries to buttress the case with other "corroboration," mainly from other abductees' recollections under hypnosis. One woman, "Erica," says she saw Linda's UFO while being floated, upright, together with numerous other people, to another UFO waiting on the banks of the East River. That Hopkins would present such a ridiculous tale as corroboration of his main claim shows with even greater force the lack of independent evidence for the claims in *Witnessed* and, since this case is supposed to be the "most important in recorded history," alien abduction claims as a whole. The real question raised by *Witnessed* is not whether Hopkins has finally proven that alien abductions are real events, but rather, how much longer will the alien abduction craze last in the face of a continuing lack of evidence?

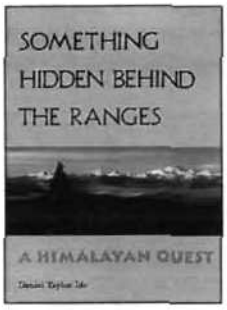
Notes

1. Not surprisingly, Hopkins discovers that this is but one of many alien encounters experienced by Linda.

2. There is an interesting inconsistency between Linda's recounting of her abduction and that of these two witnesses. Under hypnosis, Linda stated that there were five aliens in her apartment before she was transported out the window. In their letters and talks with Linda, Richard and Dan reported only three aliens floating to the craft with Linda. Where were the other two during the abduction? Did they, like a burglar recently sentenced here in Houston, decide to raid their victim's refrigerator and do some laundry using her washer and dryer?

3. The contents of these photographs contradict Linda's story of how they were taken. According to Linda, Dan had kidnapped her to a beach house and insisted she put on a nightgown like the one she wore on the night of her (now) famous abduction. She says she put the gown on over her clothes (she was wearing blue jeans) and fled down the beach, when the pictures were taken. Dan later tackled her in the surf and pulled off her wet jeans. The photographs, however, clearly show that Linda is not wearing jeans under her gown.

4. See e.g., Patrick Huyghe, "The Great High Rise Abduction," *Omni*, April 1994, and Jim Schnabel, "They're Coming to Take Us Away," *The Independent*, January 2, 1994. □



Is It Over, Yeti?

KENNETH A. SAYERS

Something Hidden Behind the Ranges: A Himalayan Quest. By Daniel Taylor-Ide. Mercury House, San Francisco, California, 1995. ISBN 1-56279-073-0. 298 pp. Softcover, $14.95.

When it comes to maybe-monsters, the Himalayan Yeti or Abominable Snowman is perhaps the world's favorite. Reportedly a man-ape five to seven feet tall, the elusive Yeti has for centuries left trails of footprints that have baffled nearly everyone. Nearly everyone, that is, except the scientists. Academia has held that the prints, almost always found in snow, are the melted and enlarged tracks of known Himalayan mammals—such as bears and langur monkeys.

That is not to say that the creatures have never been, at least allegedly, sighted. A number of well-respected Westerners claim to have encountered a Yeti, but these reports are invariably vague and give little detail. The Sherpas and other Himalayan hill people have a strong belief in the creatures, but it is often difficult to separate their real world from their metaphysical.

The modern Yeti myth began when British mountaineers Eric Shipton and Dr. Michael Ward photographed a very clear thirteen-inch Yeti footprint on Nepal's Menlungtse glacier in 1951. This five-toed print mysteriously endowed the Yeti with an air of scientific respectability, and for the next few years the Yeti seemed to rule the media. Moviegoers watched Peter Cushing and Forrest Tucker chase the Yeti across the big screen in *The Abominable Snowman of the Himalayas.* The London *Daily Mail* financed more than three hundred men to scour the mountains near Everest. And even Sir Edmund Hillary and Marlin Perkins trailed the primate that they weren't quite sure even existed.

Since that time, Yeti fever has calmed, but dozens of writers have attempted to solve the mystery. Most attempts have been mediocre at best, simply retelling countless "monster stories," and accepting at face value every unverified piece of evidence available.

A pleasant exception to this rule appeared in 1972, when Dr. John Napier, head of primate biology at the Smithsonian, published *Bigfoot: The Yeti and Sasquatch in Myth and Reality* (Jonathon Cape Ltd., 1972). In this now-classic book, Napier meticulously analyzed every Yeti footprint report that had been compiled up to that date. He had no trouble dismissing most of the tracks as those of known animals and concluded that a combination of legend and "false identity" had resulted in the modern belief in the Yeti. The aforementioned Shipton footprint was the only piece of evidence that that continued to bother Napier. He wrote: "The Shipton print . . . is the one item in the whole improbable saga that sticks in my throat; without it I would have no hesitation in dismissing the Yeti as a red herring, or, at least, a red bear."

Finally, more than twenty years after Napier penned his work on the Yeti, another writer has given the hypothetical creature the skeptical analysis it deserves. When I began reading Daniel Taylor-Ide's *Something Hidden Behind the Ranges: A Himalayan Quest,* I half expected more Sherpa monster tales, complete with out-of-focus pictures of vague indentations in the snow. Instead, I found a critical, well-written book that almost puts the Yeti to rest. In my mind, Taylor-Ide reaches his conclusions in a much more convincing manner than other authors who discount cryptozoological (i.e., unknown) animals. But before discussing why, I will disclose the main thrust of the book.

The tale is mainly of Taylor-Ide's life and his fascination with the Abominable Snowman. He opens the book speaking as an eleven-year-old living with his British family in India. One day he notices a copy of the July 4, 1956, issue of *The Statesman* lying on his kitchen table. Glaring up at him is the now-famous photograph of Shipton's Yeti footprint. Taylor-Ide becomes entranced with the legend, and ultimately, upon adulthood, ventures upon a number of expeditions to find out the truth behind the Yeti.

Taylor-Ide, at first, is certainly the typical Yeti "believer," out to find definitive evidence of a new Himalayan primate. He travels with his wife to camp in Nepal's remote Barun Valley to search for evidence. But then the focus of the story changes. Taylor-Ide finds that while the belief in a man-ape is widespread among common villagers, the expert Nepali hunters, who know the local fauna better than anyone, insist there is no such animal. And while he photographs a set of footprints almost immediately, subsequent analysis suggests that the prints come from a tree-living black bear, not a primate.

For a short time, Taylor-Ide works on proving the existence of an unknown form of tree bear in Nepal. But not too long after, he realizes that more important than the tree bear, more important than even the Yeti, is the preservation of Nepal's last wilderness. Of the 298 pages in the book, the first 176 are devoted to the search for the Yeti, the next 77 to the establishment of the Makalu-Barun National Park, and the remaining 45 to explaining away most of the available Yeti evidence.

Taylor-Ide clearly comes out of his experience certain that the Yeti is a myth. This conclusion has been reached before,

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but what is important is how Taylor-Ide reached it. Unlike numerous earlier Yeti criticisms by armchair scientists, Taylor-Ide made his findings in the field. In fact, it is quite apparent that Taylor-Ide set out on his exploits fairly convinced of the Yeti's reality. It was only after on-site research that he realized that there probably wasn't anything out there—making his conclusions all the more convincing.

Incidentally, much controversy has arisen recently concerning the "cryptozoological method," which is performed by questioning local wildlife experts in order to learn about possible scientifically unknown animals. Taylor-Ide and friends conducted such inquiries in the Barun valley. While most skeptics have endlessly criticized this method, maintaining that the interviewers ask very suggestive questions, Taylor-Ide has proven that such an approach, if done correctly, can work. And in this case he has brought forward one of the best arguments to date against the Yeti, mainly that the wildlife experts in the Himalayas—the Nepali hunters—do not believe in the creatures.

To cryptozoologists, perhaps the most important part of the book is found on pages 256 through 260. Here, Taylor-Ide tries his best to explain the 1951 Shipton footprint as an overprint of two bear tracks. To someone uninitiated in the subject, this may seem trivial. To others familiar with the Yeti legend, this is tantamount to explaining the origins of the universe, as many consider the Shipton footprint the main piece of evidence in favor of the Yeti. Taylor-Ide maintains that although his "overprint" hypothesis *seems* unlikely (considering the enigmatic clarity of the photograph), it is a much more viable alternative than accepting that it was left by a hair-covered, 600-pound primate.

Taylor-Ide's findings have importance to all those interested in a skeptical approach to cryptozoology. He relates an intelligent way to investigate reports of unknown animals, while at the same time he refrains from making evidence out of nothing. Also, his anecdotes on Himalayan life and natural history are, for the most part, accurate and extremely fascinating. Finally, and most important, Taylor-Ide communicates the need to preserve wild areas such as the Himalayas—places where human mysteries, real or imagined, can continue to thrive. □

NEW BOOKS

Astrology: What's Really in the Stars? **J. V. Stewart, M.D.** Prometheus Books, 59 John Glenn Dr., Amherst, NY 14228-2197. 1996. ISBN 1-57392-077-0. 156 pp. Hardcover, $19.95. Of the enormous literature available on astrology, only a handful of books and papers critically evaluate it. Part One of this work traces the development of astrology from ancient times to Hellenism. Part Two indicates how, because of flaws in astrology's framework, errors and discrepancies keep popping up. It recounts a variety of investigations. The verdict? The overwhelming amount of evidence indicates that horoscope astrology exhibits random, or chance, behavior.

Freud Evaluated. **Malcolm Macmillan.** MIT Press, 55 Hayword St., Cambridge, MA 02142. 1996. ISBN 0-262-6317107. 790 pp. Softcover, $35. Foreword by Frederick Crews. Since its initial publication, this critique of Freud's methods for gathering and evaluating evidence has become a classic in Freudian scholarship. This detailed analysis describes the assumptions on which Freud's work was based and shows how these assumptions interacted with his clinical observations to produce all-embracing but faulty methods for gathering and evaluating evidence.

In Search of the Light. **Susan Blackmore.** Prometheus Books, 59 John Glenn Dr., Amherst, NY 14228-2197. 1996. ISBN 1-57392-061-4. 286 pp. Softcover, $16.95. A new and updated edition of Blackmore's *Adventures of a Parapsychologist.* This autobiographical account is psychologist Blackmore's "simple personal story of how an ardent believer in all things weird and wonderful put her own beliefs on the line and ended up having to change them." In this updated version, Blackmore at last has the liberty to explain just what she found in those ill-fated experiments at Cambridge, and she updates the personal side of her conversion, as an investigator, to a skepticism toward the claims of parapsychology that is informed and modulated by her understanding of the needs of belief.

Skywatchers, Shamans, and Kings. **E. C. Krupp.** John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158. 1997. ISBN 0-471-04863-1. 364 pp. Hardcover, $27.95. Subtitled "Astronomy and the Archaeology of Power," astronomer Krupp's latest book is a journey to visit the shrines, temples, tombs, and caves where ancient priests and rulers communed with the gods of the sky. Krupp, an expert on ancient astronomy, has traveled to 1,300 ancient and prehistoric sites throughout the world where ancient people sought to symbolize or assert celestial power.

Voyages Through the Universe. **Andrew Fraknoi, David Morrison, and Sidney Wolff.** Harcourt Brace College Publishers, 150 South Independence Mall West, Philadelphia, PA 19106-3412. 1997. ISBN 0-03-020053-9. 594 pp., plus 9 appendices. Softcover, $56. A handsome new astronomy textbook designed for nonscience majors who may even be a little intimidated by science and who approach astronomy with more interest than experience. The authors approach astronomy with down-to-earth analogies and attempt to use language that appeals to students and popular readers alike. Well illustrated.

Weird Water and Fuzzy Logic: More Notes of a Fringe-Watcher. **Martin Gardner.** Prometheus Books, 59 John Glenn Dr., Amherst, NY 14228-2197. 1996. ISBN 1-57392-096-7. 260 pp. Hardcover, $25.95. A collection of 16 of Gardner's latest columns from SKEPTICAL INQUIRER (topics include probability paradoxes, Marianne Williamson, Margaret Mead, false memories, repressed memory therapy, science versus beauty, Klingon and other artificial languages, the two title essays, and others) plus thirty recent reviews of books (whose authors include Freeman Dyson, Sheldon Glashow, Heinz Pagels, Stephen Jay Gould, Richard Feynman, and Joseph Campbell) that deal with science, philosophy, theology, and the paranormal. The collection ranges widely over both good and bad science.

—Kendrick Frazier

Achenbach, Joel. "Reality Check." *Washington Post*, December 4, 1996, C1, C18. Lengthy feature essay on a "nagging problem" with the information age: "Much of the information is not true. We live in a time besotted with Bad Information." Chronicles seven fundamental types of bad information: obvious but wrong information; information censored for your own good; accurate but untrue information; millennial information; diagnostic information; statistical information; and historical information. The Web is one the main new avenues of promulgation. As Achenbach puts it, "Why get your news from seasoned professionals when you can get half-witted rumors from random strangers?"

Collins, Harry, Trevor Pinch, and N. David Mermin. "Sociologists, Scientist Continue Debate About Scientific Process." *Physics Today*, July 1996, 11–15. Sociologists Collins and Pinch first respond at some length to Mermin's two earlier columns (March and April 1996) on the controversy between scientists and the sociologists who study science. Mermin then replies, saying their comments "nicely illustrate how our views of science and scientists differ." Together with Mermin's original columns, an illuminating interchange.

Dahlstrom, W. Grant, Donald Hopkins, Leona Dahlstrom, Elizabeth Jackson, and Edward Cumella. "MMPI Findings on Astrological and Other Folklore Concepts of Personality." *Psychological Reports* 78: 1059–1070. 1996. The 2,600 community adult subjects tested in a 1989 MMPI restandardization project were grouped on the basis of their astrological sign, year of birth in the oriental yearly cycle, and day of the week of birth. The authors then carried out analyses of variance on the T scores of the basic MMPI profile scales for both males and females on each of these categories. No effect size larger than 2 percent was obtained on any scale. "No evidence was found in support of these folklore concepts."

"Evolution Teaching." *Science* 274: 904. November 8, 1996. Three thoughtful letters to the editor in response to Karen Schmidt's News and Comment article "Creationists Evolve New Strategy" (July 26, 1996).

Hamilton, Malcolm, Peter A. J. Waddington, Susan Gregory, and Ann Walker. "Eat, Drink, and Be Saved: The Spiritual Significance of Alternative Diets." *Social Compass* 42(4): 497–511. 1995. Findings from two surveys broadly support one another in the picture they give of the relationship between alternativism and diet. "They show that alternative dietary practices are to some extent associated with a worldview of which ecological concerns, holistic orientations, and perhaps seekership are a prominent part. They go beyond a concern simply with physical health in a narrow sense."

Lehrman, Sally. "Alternative Medicine: Insurers Cover New Ground." *Harvard Health Letter* 22(2). December 1996. Across the country, insurance companies are gingerly embracing therapies they had previously considered outside their realm. Some are hoping to attract new customers and lower costs; others have been forced to become more open-minded by a smattering of new state laws that require insurers to place chiropractors and acupuncturists on a par with conventional physicians. The fact remains, however, that much of the evidence for these methods comes from personal testimonials, not scientific studies.

Loevinger, Lee. "When Litigation Becomes a Lottery." *Nature* 383: 784–785. A review of Marcia Angell's *Science on Trial,* on the story of the breast implant case. It is in reality the law, not science, that is on trial in these cases, Loevinger says. "They teach that the alternative to science is not justice but ignorance; lacking scientific evidence of causation, litigation becomes a lottery."

Marin, Rick, and T. Trent Gegax. "Conspiracy Mania Feeds Our Growing National Paranoia." *Newsweek*, December 30, 1996–January 6, 1997, 64ff. Subtitled, "Aliens killed JFK. The CIA started the crack epidemic. Kurt Cobain was murdered. Who comes up with this stuff? And why do so many people believe it?" Excellent article on conspiracy theories (including Area 51 as a UFO base and the New World Order) and their believers. With an accompanying article by Richard Turner, "When Rumors Make News," subtitled "The Internet is not a news service. Read what's there with care, and be your own editor."

Oestreicher, David M. "Unraveling the *Walam Olum*." *Natural History*, October 1996, 14–21. An 1836 account of Native American origins by a naturalist named Constantine Rafinsque, supposedly written by the early Lenape (Delaware) Indians and passed down in the tribe for generations, is exposed as a hoax.

Reisner, Andrew D. "Repressed Memories: True and False." *Psychological Record* 46: 563–579. 1996. Reisner establishes, via review of published experimental and empirical evidence, that recovered repressed memories of abuse can be accurate. He says skeptics have provided important data and cogent arguments but says the more extreme assertions, that repression itself may not exist and that corroborated cases of recovered repressed memory do not exist, are not justified. He maintains that although recovered repressed memories can be valid, false memories can also occur.

"Science Versus Antiscience?" *Scientific American*, January 1997, 96–101. A Trends in Society staff report on topics recently branded "antiscience" in books by scientists and in recent conferences on the subject. The staff introduction gives an overview but worries that the "antiscience" brush may be wielded too broadly, lumping together too many different things. This is followed by three short pieces. In "Postdiluvian Science," Gary Stix visits the Institute for Creation Research, one of the oldest centers for anti-evolution activity in the U.S. In "The Furor over Feminist Science," Sasha Nemececk considers whether the more radical arm of the feminist camp is antiscientific. In "The Media's Eerie Fascination," Philip Yam considers popular TV shows (both fiction and pseudodocumentaries) that use the paranormal and reports on CSICOP's recent conference in Amherst, its formation of the Council for Media Integrity, and the blurring of information and entertainment. One conclusion is that the new marketability of pseudoscience in the mass media suggests that it will become even more prevalent.

Skolnick, Andrew A. "China Is Eager to Export Its Traditional Medicine, but Some Chinese Scientists Urge More Skepticism." *JAMA* 276(21): 1707–1709. December 4, 1996. Illustrated news report on China's plans to speed up the exportation of traditional Chinese medicines, with added discussion of the second CSICOP visit to China, subject of two recent SKEPTICAL INQUIRER articles, and the September 3 call by the Chinese Association of Science and Technology of a national campaign against superstition and pseudoscience.

—Kendrick Frazier

Two Troubles with Science

RALPH ESTLING

"How quaint the ways of paradox!" sing Gilbert and Sullivan's pirates, ashore and up to no good, in Penzance. "At common sense she gaily mocks!" And indeed, so too sing quite a number of scientists, not to be found in comic operettas, only in cosmic operettas.

Paradoxes can be fun. Most of them are just word-games or category mistakes (confusing the merely verbal with the physically actual). The best known are the ones that just go round and round in logical circles until they disappear up their own self-reference, like the "Cretan liar" paradox, of which there are thousands of variations, my favorite (because I have just this minute made it up) being: The Pope issues an edict *ex cathedra* announcing infallibly that all edicts issued *ex cathedra* are not infallible and never were. But in his haste to right past arrogance he neglects to make an exception of *his* edict. As a consequence, this edict is also fallible, which naturally makes all edicts infallible. But then, if all edicts are infallible, then so is this one. That being so, all edicts are fallible. But if all edicts are fallible . . . and so onward, ever onward, it goes. The point to this seeming paradox (for there is a point) is that it's all words. Once we move out of the realm of words and into the realm of objective reality, we can dismiss the verbiage with a logical syllogism (expressed in words, yes, but having physical actuality underlying them, a somewhat different state of affairs from what has gone before):

Major Premise: All humans are fallible.
Minor Premise: All popes are human.
Conclusion: Guess what.

Lots of harmless amusement for a wet Sunday afternoon. But alas, this is not a diversion available for science.

The trouble with paradoxes in science is that you can't have them. You can have the *appearance* of them, but not the reality. They must be soluble, at least in principle. If not, we cease having science. This holds true in physics and down through everything in science derived from physics, which boils down to everything. This is why we can't have universes popping causelessly into existence out of Absolute Nothingness; why we can't settle for the Copenhagen Interpretation as the explanation, or rather, nonexplanation, of quantum mechanics; why you can't travel back in time and kill your grandfather previous to your having been born, or however it goes; why the origins of life, consciousness, and intelligence cannot be dismissed as a miracle; why Achilles will leave his tortoise standing in the dust of his heels; and why arrows shot from bows do not stand stock still in the air; among other things.

If we believe in science and in its underlying rationality, then we can't stop at some particular place and say, "Beyond this point there be Tygers, paradoxes, the miraculous, the inexplicable." The trouble with science (one of the troubles) is that it isn't divisible; it doesn't take us so far and no farther, where we are forced to disembark and continue the rest of the voyage by miracle and marvel. If we believe in the need for miracles at *any* point in our journey, then we must give up on science altogether, right from the start. Science is an all-or-nothing thing, like being pregnant. The fact that many scientists don't think this way doesn't change matters. It may, of course, be that our ability to understand the "ultimate nature of things" is limited, but this doesn't mean there is no ultimate nature of things or that their ultimate nature must be in the realm of miracles. Comprehension does not limit the physical reality of the universe, whatever or however complex (or simple) that underlying physical reality may be. Once we think comprehension limits physical reality, or even might, we leave science and enter into the gassy regions of metaphysics, the Land of Let's-Pretend.

The Uncertainty of Heisenberg, the Incompleteness of Gödel, the wave/particle duality of light and matter, relativity—none of these is paradoxical. The

Occasional columnist Ralph Estling writes from Ilminster, Somerset, U.K.

fact that observation and even logic itself are limited, or that the underlying nature of things is merely probabilistic, may be distressing, but there is nothing paradoxical, nothing that contradicts itself. The appearance of a paradox is eventually resolved when better methods and better insights are developed. But the real point is, even if better methods and better insights are never developed, even if we never arrive at the resolution, the ultimate and rational nature of things is there; and it is there even if throughout the whole universe, in all space and in all time, there is and will be no intellect capable of resolving it. The capacity of minds to comprehend is not what makes reality real.

That is the first "trouble" with science.

The second trouble becomes apparent when good and kind people tell us that science is inadequate, this because it doggedly refuses to inform us how we should live our lives—by what ethical and moral principles we should live; how, why, and whom we should love; and so on. This complaint is widespread among the righteous.

The trouble here is that science is confused with rationality, as if the two were synonymous, when in fact science is just one subset, one kind, of rationality, not the whole shebang. It is a vital part, but still only a part of the whole. As such, it does not deal with all forms of rationality, all logical inquiry and pursuits, such as how we should conduct our lives. That is not its job.

It is not science's job to supply answers to all our questions about why we are here and what we are to do about it. When it refuses to do so, it is not shirking its responsibility, abdicating its role. It is refusing to usurp the responsibility and role of reason, of which it forms a part, but with which it is not identical.

Now things get complicated, but not really paradoxical.

While science's task is to resolve what is and isn't the case with reality, it doesn't follow that its task is to resolve what is and isn't moral and ethical. But something else doesn't follow: it doesn't follow that scientists have no such task, that they can plan hydrogen bombs on the blueprint and then proclaim, if those bombs are used, that their hands are clean, that they have no moral accountability and no role in the consequences that follow from their plans, that they are merely the idea people, and what others do with their ideas is of no concern to them. The trouble with *this* is that scientists are also responsible human beings, citizens. Just as science is part, but not the whole, of rationality, scientists are part of humankind. The bell tolls for them, too, even when they stuff their fingers in their ears.

This brings us to a third trouble, but the trouble is with scientists, not science. And that is a whole new ball game. □

I'm a Believer

STEVE NADIS

I've been a skeptic for most of my grouchy existence. I recall, for instance, in first grade when my teacher talked about the earth's being round. "Not where I live," I told her, unwilling to accept such a radical concept on faith. The globe she pointed to failed to convince, as it bore little resemblance to the neighborhood I was familiar with. Shortly thereafter, while gazing at the horizon from an airplane and noticing what appeared to be an ever-so-subtle curvature, I started thinking there might be something to this round-earth theory after all. . . .

With this conceptual breakthrough, I slowly gravitated toward the teachings of modern science—a practice that suited my questioning (and some said intractable) personality—at the same time pulling back from the superstitions of youth. I chided my companions for their puerile convictions, arguing in vain, it seemed, that if they never amounted to much in life—an outcome that seemed entirely plausible—it would be the result of the (bad) choices they made and skills they developed (or failed to develop), not a chance encounter on a back alley with an errant, dark-hued feline.

Eventually I became the consummate man of science—quizzical, analytical, and methodical—systematically laying waste to the crackpot ideas that were repeated, ad infinitum, by my peers, the so-called "Joe 12-Packs" of the world. Despite my veneer of certitude, there were times when I had my doubts. I wondered, for instance, whether my skepticism was a kind of protective mechanism—something to shield me from the array of experiences (foolish, yet scary) that my comrades seemed to be reveling in.

And suddenly it all changed, as if the foundation of rationalism was ripped, without warning, from under my feet. The epiphany—and I use the term sparingly—caught me in the middle of a mundane cleaning chore. The radio was on, blasting the old Monkees tune "I'm a Believer," and I somehow got swept up by the enthusiasm of the moment, imbuing the song with a profundity its creators probably never dreamed of.

Yes, I thought, wouldn't it be fun to

Steve Nadis' work has appeared in numerous magazines, including Omni, Nature, Science, Technology Review, New Scientist, Air & Space, *and* The Atlantic Monthly.

believe for a change? Must I be locked, forever, in the tiresome role of curmudgeon at the breakfast table? Would I remain the perennial party-killer, dashing dinner table conversations with the dreary voice of reason, dispensing my wry observations with the tact and delicacy of an exterminator? "No, no, NO!" I cried. "I CAN CHANGE." I vowed to conquer my fear and walk across the hot coals. And I would do this not because of the poor thermal conductivity of said mineral but because of the unswerving strength of my convictions.

The world suddenly opened up before my eyes. If you believe, and I mean truly believe, the possibilities are endless. Ross Perot could be president of the United States, and John ("Who am I? Why am I here?") Stockdale could be vice president of this, the greatest nation on earth since Woodstock Nation.

Carl Sagan once said that believing there's a face on Mars is like seeing the face of Jesus Christ on a tortilla chip, but maybe he (Sagan, that is, not He or His son) had it all wrong. I mean, if the Prince of Peace truly materialized on a "Cool Ranch" tortilla chip, wouldn't that be something to marvel at, at least for a second, before downing the tempting morsel in a single bite? Maybe it's time to get rid of all the negativity that clouds our outlook to the extent that we can't appreciate a religious icon when it's leaping out at us from our junk food. I, for one, decided to take Sagan's famous utterance and stand it on its head: "Extraordinary claims require extraordinary beliefs."

My personal transformation was liberating, literally lifting me off the ground. I levitated at the local TM center and also joined in advanced group-meditation sessions that wiped out world hunger, took violence off the streets and put it in our TV shows where it belonged, and created harmony among the previously off-key members of my local barbershop quartet. I met Deepak Chopra and found my chakra all on the same day, and we hit it off (Chopra, chakra, and I), right from the start. I visited a healer who couldn't do a thing for me, which was just fine because I wasn't in any pain. I tried jujitsu, shiatsu, and shiitake mushrooms, balancing my chi in between courses. My guardian angel didn't get through to me directly but did leave a message on my voice mail. As if that weren't enough, I somehow found time to confront my inner child and challenge him to a wrist-wrestling match, which I won, hands down. I kept up this giddy pace, even in my sleep, taking control of my dreams to earn millions, which I wisely invested before waking up each morning.

It was a frantic, exhilarating time, but deep down I had the disquieting sense that it couldn't last forever. Then it ended, just as suddenly as it began. Oddly enough, the Monkees began touring again. I heard one of them on the radio being interviewed. "We're playing all new songs," he said, dismissing earlier hits such as "I'm a Believer" and "Last Train to Clarksville" as "pure fluff." This was, of course, devastating to me. How could I continue believing in these songs when their authors, the Monkees, one of the most successful bands created strictly for prime-time television, didn't believe a single word? Even Davy Jones disavowed his famous ballad "I Wanna Be Free," claiming the record company had trapped him in a dead-end contract for years.

That was the last straw, catapulting me back to my sober (boring?) life as a skeptic, a life of dousing talk of spontaneous human combustion with a few choice remarks and getting abductees so turned around they don't know where they've been. When I think back to my journey, I sometimes wonder where *I've* been. But this funny little detour has made me a more effective spokesperson for the naysaying cause. For I have seen the enemy close up, inhabited the alluring realm of miracles and faith, and emerged from the experience a better, more integrated person, with the skeptical side of myself closer to my believing side, and both in touch with Deepak's literary agent. A chronicle of my "spiritual odyssey" will, I'm told, quickly climb the *New York Times* bestseller list, ultimately replacing my friends Deepak, James ("The Prophet") Redfield, and Sophie ("Angel Face") Burnham at the summit. "It's gonna happen," my agent insisted in a calm, reassuring voice. "You just got to believe." □

Don't Think About Pseudoscience . . . *Without*

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FRINGE-WATCHER *from page 18*

The Bab took great pride in having 2 × 9 = 18 chief disciples who, together with himself, made 19. Babism included a gematria that rivaled the Cabala in its obsession with hidden meanings based on assigning numbers to the twenty-eight Arabic letters. Nineteen was found everywhere, notably as the sum of the numerical values of the Arabic and Persian letters of *Wahid*, the word for *One*, one of Allah's chief names.

The product of 19 and 19 is 361, which the Babists called "the number of all things." It is the number of days in the Babist calendar, still used by the Baha'is. Their year consists of nineteen months, each with nineteen days. The extra four days are intercalary, with a fifth day added during leap years. When the Bab made his pilgrimage to Mecca, he sacrificed nineteen lambs.

Wherever possible, the Babists divided things into nineteen parts. The years form nineteen cycles, of which we are now in the eighth. The Bab's followers even tried to base a coinage on nineteen, but had to abandon it as impractical. On the first day of each month, the Baha'is, following the Bab's instructions, assemble for the Feast of the Nineteenth Day. International offices are governed by nine leaders, selected by 3 × 9 = 27 "custodians of the faith."

Farrakhan's initials are L. F. Using the cipher A = 1, B = 2, and so on, his initials add to 18, one short of 19. Maybe he should change his first name to Moses or Muhammad.

My next column will tell the tragic story of Dr. Rashad Khalifa, who tried to convince the world that the prevalence of 19 in the Koran proved it was written by Allah, and who was stabbed to death in 1990 for his heretical opinions.

Notes

1. I suspect that Jerry Lucas is now much ashamed of this book, but not Del Washburn. In 1994 Scarborough House published his *Theomatics II: God's Best-Kept Secret Revealed*. Steve Abbott, reviewing this ridiculous book in the *Mathematical Gazette* (July 1996), wrote: "I have wondered how to dispose of it. I have rejected throwing it in the dustbin, as I can't bear to destroy books. I could give it to a charitable shop, but it might be bought by someone impressionable, and I wouldn't want to be responsible for the consequences. So it will stay on my shelf unread, unless a *Gazette* reader asks me for it."

2. Farrakhan's history is flawed. The first slave ship did not arrive on our shores until 1619. □

MEDIA WATCH *from page 22*

Philadelphia Experiment, numerology, ancient astronauts, the Bermuda Triangle, and the Kennedy assassination are all part of a grand conspiracy).

It demonstrates how much space aliens, the Roswell case, Area 51, and government coverups about UFOs have become a bonafide American legend.

* * * *

On another matter . . .

After catching some trusting readers off guard with bogus stories about unearthing the Holy Grail in Jerusalem and the discovery of carnivorous mole-like creatures that melt their way through the Antarctic ice, *Discover* magazine tried to be a little less subtle when it published its annual ersatz science report in last year's April issue.

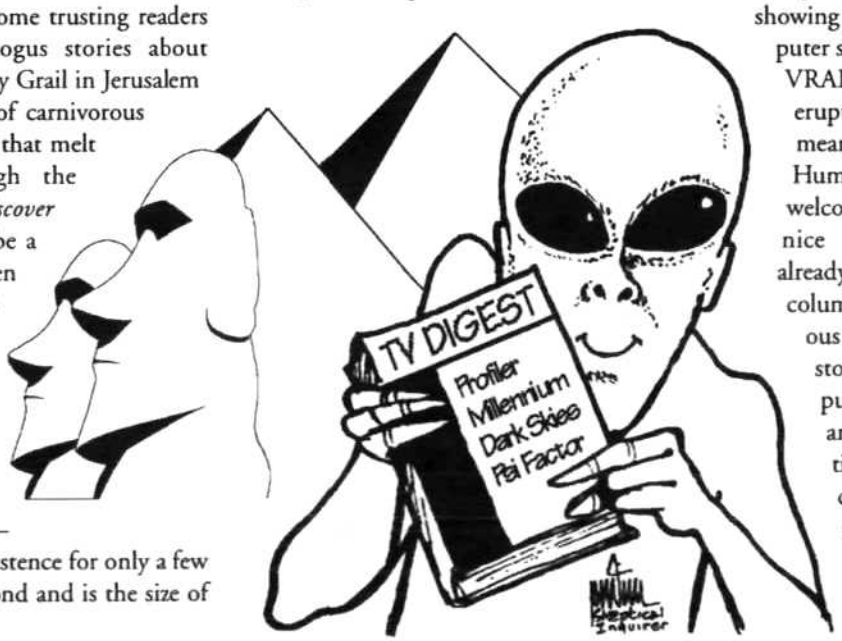
The fake story was about a new fundamental particle—*the bigon*—which pops into existence for only a few millionths of a second and is the size of a bowling ball.

The magazine quoted one of the two researchers, who have been "building better vacuum tubes to replace microchips," as suggesting that "[b]igons could be responsible for ball lightning, migraines, the unexplained failures of equipment and soufflés, spontaneous human combustion—I don't know, maybe earthquakes even."

Instead of relying on readers to know Italian or Japanese to get the joke (one researcher's name in their 1995 story, for example, was April Fool in Italian), the April 1996 article bluntly asked if "there is any chance that the bigon is just a figment—or some kind of ridiculous April Fool's joke."

Then it quoted researcher Jean-Xavier Zweistein as asking whether "tripping dinosaurs (and) surfing clams" are any less incredible. That quote should have struck some readers as odd because surfing clams and tripping dinosaurs were mentioned several pages earlier in the same issue.

The caption on one of the pictures, showing a bigon smashing a computer screen, reads: "C'EST PAS VRAI! An evanescent bigon erupts in Paris." *C'est pas vrai* means "It is not true."



Humor and whimsy are always welcome in science, and it's nice that *Discover* (which already has a monthly humor column) tried to be more obvious about last year's bogus story. But asking readers to puzzle over which stories are true and which are fiction is still a job best left to consumers of the supermarket tabloids.

Discover's April 1997 issue will appear in mid-March. □

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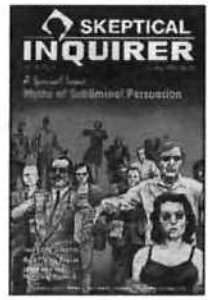

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The Saving of Science and the Problem of Antiscience

I have been waiting a long time for an article like the one by Leon Lederman, "A Strategy for Saving Science" (November/December 1996). This is what SKEPTICAL INQUIRER should be all about and we need more of it. I cannot remember an article that addressed the problem of the antiscience movement so well without sounding like a self-righteous scientist.

Moreover, we are not going to be able to continue to fend off the antiscience movement until we recognize and come to better grips with science's shortcomings. First and foremost, we must make science more interesting and enlightening, promote the idea that it is people not science that have misapplied science's gifts, recognize scientific misconduct (see *American Scientist* 1996, 84: 479), and illuminate the scientific method. The latter, *SI* has had little of, and, as far as I can tell, scientists seem to understand the method poorly themselves and say the dumbest things.

Otherwise, with *SI*'s limited space, kindly focus on those bits of antiscience that do real harm such as creationism, quackery, revived memory, the distortion of science in the courtroom, and the like, rather than this obsession with the paranormal. Thanks guys.

F. DeWolfe Miller
Professor of Epidemiology
University of Hawaii
Honolulu, Hawaii

Considering the growing emphasis on teaching science, and being very impressed by Leon M. Lederman's "A Strategy for Saving Science," I suggest that science is a method and should be taught as such. Physics, math, and chemistry are important subjects, but science is the basic approach to the material world. Therefore, all institutions of higher learning must be encouraged to establish a course in the method itself. After many years of college teaching, I am dismayed by the fact that so many otherwise competent teachers know little of the origin and nature of science.

In the presentation of such a course a cue can be taken from Aristotle. To paraphrase, "They who consider things in their first growth and origin will obtain the clearest view of them." Thus the lectures should begin at the beginning, with the Greeks. Concepts such as logic, natural law, and debate should be brought into focus along with the contributing individuals—Thales, Socrates, Plato, Aristotle, and Democritus, among many. Then on through history with Descartes, Galileo, and even on to Karl Popper. The latter part should deal with the more historically recent developments in the scientific method, with emphasis on experimental and control groups, operational definitions, random samples, variables, blind studies, replication, statistical analysis, and all such.

The course, with its controversial aspects, would surely arouse student interest while providing intellectual stimulation. Certainly, if humankind is to prosper harmoniously, scientific literacy is a "sine qua non." We must not fail.

Kenneth Poole
Cloverdale, Ore.

Leon M. Lederman's plaintive cry for education reform was heartfelt, and many of his points were inarguably valid. I would like to add a few observations he missed.

The major problem in American education is not so much curriculum as it is what curriculum must compete with. And I do not mean television and the mall, although they contribute. No, I mean the basic mandate of our educational system, which is not, despite all the rhetoric, to educate but to socialize. All one must do to recognize this is study the disproportionate attention athletic programs receive over all other aspects of the school experience. Individual schools become defined in the public mind by their football or basketball teams, by homecoming events, by the trophies they collect in baseball, soccer, field hockey, track. The best resources of our schools go to praising and lauding the athletic heroes at the expense of the academics. This is socialization. . . .

Learning, whether it is done in a group or alone, is still a solitary achievement. An individual learns, not a crowd. We do not suddenly understand something because our neighbor has figured it out—we must figure it out, too, alone, inside our heads. All the jokes about geeks and nerds are based on kids who do not conform, and many of them go on to become scientists, engineers—the very sort of people we are now saying we are in danger of losing in the face of growing popularity in antiscience. What is a nerd? Someone who is not socialized in conformity with the dominant group. . . .

The other problem is one of expectation. I think it is unreasonable to expect most students to ever care that much about what you have to teach them. The unspoken heresy that hides in every discussion about failing students, failing schools, new or old standards, and what to do about it is that most kids aren't interested. . . .

Realistically, I think we should look at drawing the poison from the beast we have created. They are interlocked—the schools socialize, the society rewards conformity, and real learning is coincidental to both. I agree with Mr. Lederman that steps have been taken and some of them are encouraging. But I do not think we should proceed without acknowledging certain aspects of the problem that have become sacred cows in our culture; otherwise we'll fall into the same trap again. If we can change that figure of 93.8 percent (or 97.3 percent) scientifically illiterate to a solid 90 percent, then we would actually see changes. We have seen in the last thirty years that small numbers—small in proportion to the total population—can have vast effects. . . . Start with the achievable. If 10 percent of the total population of this country was genuinely scientifically literate, what might that mean in terms of our national self-image and, by extension, our ability to confront the future?

Mark W. Tiedemann
St. Louis, Mo.

Leon Lederman's article contained a number of excellent points about the future of scientific research in the United States, particularly his recognition of the focus on short-term results in the public and (especially) private sectors. I agree that better education, particularly in the natural and physical sciences and mathematics, is necessary for people to cope with our increasingly technological world and solve problems such as hunger and disease.

Many of the educational goals presented by Lederman can be achieved by first stimulating young students' interests in these fields. Perhaps scientists could spend some time visiting schools to talk about their work. Such talks may include the application of the scientific method to solving problems, and the application of math, physics, chemistry, biology, etc., to these problems. The students may gain an appre-

ciation for their schoolwork by being presented with applications of these subjects. As a result, more students may choose to become scientists, engineers, or physicians.

Perhaps I am missing something, but there appeared to be a disturbing element in Lederman's paper. He appears to categorize the freshmen Republican Congressmen with the Unabomber, and even suggests that they "will starve and torture science to a slow and agonizing death." This type of partisan comment is akin to the particularly ugly campaign rhetoric coming from the other side of the political spectrum, and as such, serves to partially undermine the credibility of an otherwise fine paper.

May I suggest that if the two political parties differ on the amount of support that they favor for research, that this data be presented in context and by category with the proposed sources of funding. The readers may make up their own minds as to the magnitude and the significance of these differences, and draw their own conclusions as to which party best serves the interests of the country (or the reader.)

Keith G. Tomazi
Florissant, Mo.

Leon Lederman's article on education consists mainly of hopes and wishes rather than the strategy promised in its title. Who could object to the statement that scientists, educators, psychologists, and others must work to improve education? That goal receives lip service from the same people and groups that collectively form the chief obstacle to its realization: teachers' unions, state and federal bureaucrats, and colleges of education. To achieve it, they say, we must give them more money and more power. Dr. Lederman suggests the creation of a high command center to direct the reforms he hopes for, but the probable result would be merely another layer of bureaucracy on top of the present Department of Education.

Real reform would mean the imposition of academic requirements that many students would fail to meet; education for all is education for none. Under the present system, colleges and universities get more money for every warm body they can pack into a classroom. Money talks louder than anything else, and the incentive to lower standards is irresistible.

In the public schools, the authority once held by the principals and school boards to fire incompetent teachers and expel unruly students could be restored by repealing the laws and regulations that often frustrate such actions. Greater autonomy might have adverse effects in some districts by giving more power to creationists. But there are no perfect solutions, only trade-offs. The creationists, although they are a nuisance, are not the main problem.

David A. Shotwell
Alpine, Texas

The talk given by Leon Lederman on June 20, 1996, to the World Skeptics Congress in Amherst, New York, has now appeared in the SKEPTICAL INQUIRER. But an important topic is missing from the article which was brought up in the stimulating discussion period after the talk. Someone asked about the eight-page article "Healing by Prayer" that appeared in the June 24 *Time* magazine. This *Time* article mentioned several experiments where religious activists prayed for certain individuals who had medical problems. *Time* reported healing progress whether or not the individuals knew of the praying that was being done on their behalf.

Lederman's immediate response was that praying might be of psychological help to those who knew about the praying, but it could *never* be of any help to those who were not informed of the praying. Lederman also observed that there are people who are so ignorant of science and critical thinking that they don't see any importance in whether or not the individuals were informed of the praying. This example can be used as a simple test of "scientific literacy." Just ask a person whether he or she agrees with Lederman's assertion that praying could never be of help to those who were not informed of the praying.

This question can also be useful in training people how to think straight. We should point out to the public that if unknown prayers did have any effect of any kind, there would be a new kind of information transmission in opposition to physics as we know it. Its discovery would certainly be worth at least one Nobel Prize of $1,200,000. The *Time* science writer wrote: ". . . the patients were not told of the experiment. Remarkably, Byrd found that the control group was five times as likely to need antibiotics and three times as likely to develop complications as those who were prayed for. Byrd's [1988] experiment has never been replicated and has come under some criticism for design flaws."

But *Time* has missed the point. If this experiment is correct, there is now an easy and sensitive way to quantitatively measure a new kind of mysterious "force" that would revolutionize all of science. My conclusion is that we have science writers and editors who do not understand science and who should not be writing about science. *Time* should feel an obligation to help teach science to students and the public. Instead they are giving pseudoscience a pat on the back. Real scientists were not given a proper opportunity to answer the pseudoscience bias in this "Medicine" section of *Time*.

Jay Orear
Professor of Physics
Cornell University
Ithaca, N.Y.

Leon Lederman responds:

I thank Prof. Miller for his good remarks. I agree that some forms of junk science are indeed more harmful than others. Astrology has been around a very long time and is relatively harmless except when it colors Presidential decisions.

Dr. Poole touches a subject near and dear to me—the value of a historical approach to science-as-culture, for both the future scientist and *the future educated citizen.*

Mark Tiedemann hits the mark with eloquence on issues that distort the educational process. It is just because of such issues that I proposed a "central HQ" that would have a coordinated strategy. Only in this way could any specific reform take into account the obstacles to acceptance.

Mr. Tomazi criticizes my partisan comment about the "new" (presumably now chastened) Republican Congress. Mea culpa! This was a cry of frustration because even the traditionally pro-science Republican leadership admitted to helplessness in the face of an out-of-control bloc that, in the mood of 1995, would listen to no arguments. Tomazi is correct in his admonition.

David Shotwell reminds me of the chorus at any efforts to reform the educational system. Education is a place of strong opinions, most of them contradictory, most of them even correct. But Shotwell's comment gives me another crack at it. How do *we fix edu-*

cation so that skepticism and a grasp of how science works is as core as English and history? One way is to advance on many fronts in small steps. My article listed some of these. The other way is to make education and science literacy a national priority, roughly at the level of our small wars. Then we could have this "high command," but, in contrast to the present Department of Education, it could have authority and discretionary funding. Our founding fathers, in giving education to the states, could not have anticipated the degree of national dependence on quality education. I believe it is time to give the federal government some of the responsibility. National security, in its broadest sense, requires that Alabama and Oregon have the same high educational standards, allowing for the necessary local variations in how to achieve these standards.

Prof. Orear's remarks are of course valid although the prospects for a scientific test of the efficacy of prayer raises questions of awesome complexity. Media obsession with junk science is prima facie evidence for the need for SKEPTICAL INQUIRER.

Truth, Reality, Paradigms, and Kuhn

I found Martin Gardner's recent references to John Dewey and Thomas Kuhn troubling ("Physicist Alan Sokal's Hilarious Hoax," November/December 1996).

In defense of the correspondence theory of truth, Mr. Gardner wrote: "It is denied only by a small minority of pragmatists who still buy John Dewey's obsolete epistemology." Buy? Obsolete? Surely that is the language of polemics rather than of rational discourse.

In attacking Thomas Kuhn, Mr. Gardner quotes a sentence from *The Structure of Scientific Revolutions*: "We may, to be more precise, have to relinquish the notion, explicit or implicit, that changes in paradigm carry scientists and those who learn from them closer and closer to the truth." Mr. Gardner asserts that to be an "incredible statement" and an "absurdity."

Even stronger polemics. But this time Mr. Gardner attempts a substantive rebuttal: "As if Copernicus did not get closer than Ptolemy, or Einstein closer than Newton, or quantum theory closer than earlier theories of matter! It takes only a glance at a working television set to see the absurdity of Kuhn's remark."

What is wrong with that rebuttal? For one thing, it misses the point. Mr. Kuhn does not dispute that science has worked and continues to work. What he seems to be agnostic about—although he is fairly cryptic in further discussing the sentence that Mr. Gardner quotes—is the relationship between human generalizations and the reality that may be "out there." This is, after all, an agnosticism that Kant, building on Hume, embedded in Western thought.

It seems to be that very agnosticism that has driven Mr. Gardner wild. He seems to believe passionately that science does indeed get to "the truth," that "truth" is correspondence with objective reality, and that anyone who doubts these propositions must be outside the pale of civil discussion.

But fundamental questions—such as the nature of objective reality and ultimate truth—do not involve the distortion or fabrication of evidence, which writers for SKEPTICAL INQUIRER, including Mr. Gardner, have so effectively and beneficially exposed. I submit that the courteous civility of the exchanges between Bertrand Russell and John Dewey would be a model for debating such fundamental issues far superior to polemic and insult.

Mr. Gardner objects not only to the beliefs of Messrs. Dewey and Kuhn, but also to their ability to influence others. He asserts that *The Structure of Scientific Revolutions* "has been responsible for much postmodern mischief." With such a statement, Mr. Gardner joins a long historical tradition of those who feared the contagion of false and dangerous ideas.

The classical defenders of freedom of thought have stressed the advantages of allowing all doctrines to compete in the marketplace of ideas. One of the essential elements of the skeptical cast of mind is the continuing willingness to question one's own basic assumptions. Such a willingness provides long-term advantages to the scientific enterprise, as well as to other realms of discourse. Even Mr. Gardner's own rebuttal to Mr. Kuhn, cited above, demonstrates this point. The great leaps forward that Mr. Gardner refers to came when assumptions were challenged that had been almost unanimously considered self-evident—that the sun circled the earth, that space and time were fixed dimensions, that absolute causality operated at the subatomic level. Who is to say what theoretical impasses of the future might be resolved by questioning assumptions that in today's world are widely considered self-evident? Mr. Gardner's rebuttal to Mr. Kuhn rests on the point that science has worked. (Incidentally, a pragmatic criterion). And, of course, he's absolutely right about that. But does that eliminate the possibility that, in the future, paradigmatic changes could take wrong turns? Logically, no. And if one is interested in avoiding possible wrong turns, one should applaud the view that fundamental assumptions should be subjected to continual scrutiny, even at the risk of suffering ideas one believes to be absurd.

Melvin H. Levine
New Bedford, Mass.

I request that my subscription to SKEPTICAL INQUIRER be canceled. It is with some degree of sadness that I do so, since I have enjoyed for the last few months your insightful refutations of pseudoscience and your commitment to disseminating information about the latest assaults on science and scientific education in the United States.

While I have been usually appalled by your treatment of so-called "postmodernism," the article by Martin Gardner in the November/December 1996 issue crossed over the line of what I consider acceptable discourse. It was reminiscent not of the objective pursuit of truth I associate with CSICOP, but of the types of argumentation you theoretically deplore. In addition, I find it a little pathetic that more than five months after the Sokal hoax incident, SKEPTICAL INQUIRER is still running articles about it. Rather than continue to gloat, a constructive treatment of the philosophy and sociology of science might be welcome, particularly from a foundation which boasts such thinkers as Stephen Toulmin on its list of fellows. . . .

Gardner writes, "It's just that the sociologists [I presume Gardner means "of science," but given the catchall of "postmodernism," I am not sure] and postmoderns talk funny." Of course, scientists are allowed to have arcane language because "science distinguishes sharply between language and science." This is a rather contorted argument, since sociologists talk "normal" in everyday life. All fields have their jargon. As a doctoral student in political science, I am not quite clear why it is unacceptable for me to talk about

neorealism, neoliberal institutionalism, structural functionalism, constructivism, k-groups, public choice theory, . . . while scientists are somehow exempt from the admonition to speak clearly. At least "discursive context" is in English! In the very same issue, *SI* carried an article in the News and Comment section which reported that only 9 percent of the American public knows what a molecule is. It is sad that *all* academics have not focused more on communicating their ideas to those outside their specialties.

Gardner also, bizarrely enough, argues that "scientists and ordinary people talk in a language that takes for granted an external world with structures and laws not made by us." While I agree with the thrust of this argument when applied to the natural universe, Gardner should remember that a majority of the same public also does not believe in evolution. Argument by popular appeal is never logically persuasive.

It is interesting that the late Thomas Kuhn (who actually was a scientist) gets singled out for scorn. Whether Gardner likes it or not, Kuhn revolutionized philosophy of science and, although not all of his ideas have withstood criticism, remains a seminal thinker. Gardner attacks Kuhn for arguing that changes in paradigms do not inexorably lead to progress in science with the dismissive comment, "as if Copernicus did not get closer than Ptolemy, or Einstein closer than Newton, or quantum theory closer than earlier theories of matter!" Of course, Gardner ignores other thinkers who advanced geocentric world-views in the interim between Ptolemy and Copernicus, as well as many other missteps along the way. The fact that if you expand the time frame far enough you can identify progress in no way undermines Kuhn's argument that paradigmatic shift is not explicable on solely rational grounds.

Daniel H. Nexon
New York, N.Y.

Martin Gardner replies:

It's impossible to write a brief reply to the angry letters from Levine and Nexon. Of course my columns are polemical. They are not intended to be polite technical arguments. Readers interested in my views about truth and realism (I am well aware that science is fallible) will find them clearly expressed in Whys of a Philosophical Scrivener, *including a careful discussion of the famous controversy between Dewey and Russell over how to define truth.*

Isaac Newton: Genius and Human Being

Normally this Anglican biologist greatly enjoys Martin Gardner's column. On this occasion—his column on Isaac Newton (September/October 1996)—my reaction was more mixed. One does not want Newton perpetuated as a Victorian plaster saint. But Gardner's portrait of Sir Isaac, though often interesting, is in many places so warts-and-all that one can hardly see the all for the warts.

Newton is labeled as a "fundamentalist." In fact his scriptural analysis was often quite radical by the standards of time. For example, he anticipated the conclusion of nineteenth-century German biblical critics like Graf and Wellhausen that the Pentateuch is not directly the work of Moses, but has undergone later redactions. His treatment of books like Chronicles and Daniel was likewise innovatively critical. We also read that Newton was an Arian who rejected the standard Athanasian doctrine of the Trinity. Too much can be made of this; Newton criticized both Athanasius and Arius. As in many recent writings on Newton, much is made of his unseemly interest in matters theological—and his shocking celibacy (pluralism has its limits, apparently). Both were a sine qua non for one in Newton's academic position at the time.

Sir Isaac's interest in alchemical texts is, as Toulmin and Goodfield point out in *The Architecture of Matter*, not particularly surprising. Despite the dross, they provided such empirical data on chemical processes as was then available. Newton went on to do plenty of empirical chemical experiments of his own, and he made good use of them in the seminal concluding "Queries" of his *Opticks*. As Toulmin and Goodfield stress, these passages are, in the main, brilliant explorations of the nature of matter, not the witterings of Keynes' last of the Magi. Likewise, Newton's searches for transformations of base metal into gold could not be ruled out as intrinsically absurd—witness the modern transmutations of elements by nuclear rather than chemical means. This distinction is, of course, post-Newtonian in any case.

Newton's character is painted in the bleakest possible terms. If he was so obsessed with priority, why was he so notoriously tardy in communicating his discoveries—so much so that Halley had to drag the *Principia* out of him? Priority disputes were notoriously common at the time because conventions for assigning priority had not yet been established. Gardner repeats the charge that Newton in his capacity as head of the Mint pursued counterfeiters with ruthless relish. Westfall points out in his classic biography that Newton tried to get out of that part of the job. As A. R. Hall sums up in *From Galileo to Newton*, the sage indeed had a bleaker side; but his friends in later life portray him as a generally affable figure.

All such analyses of Newton show is that he was a human being. They also show that despite his genius, he was in a number of ways a man of his times. These are surely not very surprising findings. They can nevertheless be of value if they warn us against similar tunnel vision in ourselves and our own age.

David Elder
Grange, SA
Australia

Martin Gardner replies:

I have no objections to Mr. Elder's defense of Newton's good sides. The term "fundamentalist," however, clearly applies to Newton in spite of his eccentric deviations from Anglican orthodoxy. Martin Luther, too, was "radical" in rebelling against an established church. He tossed the book of James out of his Bible, calling it an "epistle of straw," but that doesn't make Luther any less of a believer in Biblical inerrancy. I yield to no one in my admiration of Newton as a scientist, but his Biblical criticisms were far below those of many contemporaries: Locke, Leibniz, and Spinoza, to mention only three.

Claims of Human Combustion

Joe Nickell, in his excellent review of Larry Arnold's *Ablaze!* (November/December 1996), jolted me back to the reality that we have not done enough to encourage the public to question claims of "spontaneous human combustion" (SHC). I hope

readers will circulate this review to appropriate people or agencies as a first step.

Second, I recommend a half-hour program called "Human Combustion" that was recently aired on The Learning Channel. Produced in 1989 by the BBC, it covers several claims of SHC in England and Wales and offers the same refutations as does Nickell. In addition, the program provides some other information that might prove useful to investigators of such claims:

1) Claims of SHC are based on fires in enclosed spaces, which differ from fires in the open air, where there is a virtually unlimited supply of oxygen.

2) In an enclosed space, combustion will eventually deplete the available oxygen to less than 16 percent of the air, at which time the high-temperature open flames are replaced by a smoldering combustion. The temperature of this smoldering is sufficient to continue the "human candle" and "wick" effects, but not sufficient to ignite nearby materials (such as paper) that are not impregnated with, say, liquefied fat.

3) Britain operates a Fire Research Centre, which, in addition to a test chamber, uses computer software to simulate the life of a fire (including SHC cases), given such parameters as volume of the enclosed space and types and locations of materials contained in the space. Among other output are temperature readings at various locations in the fire space and the percentage of various gases (including oxygen) in the enclosed atmosphere. I hope they can make this available to other researchers.

If this program is aired again, I would recommend taping it, for reference at least. It might also be available through catalog sales of BBC programs. Since it is only thirty minutes long, it could easily serve as a presentation aid.

James M. Price
Stillwater, Okla.

Perhaps Joe Nickell has not thought of an empirical test that could be performed to prove some of his assertions concerning spontaneous human combustion. Hey, I got one. Go to the stockyards, purchase the carcass of a hog, and see if you could set it on fire.

In the experiment, you could get a good supply of matches and cigarettes and Mary Reeser gowns and Dr. Bently robes and flammable linoleum and hardwood flooring, and pile it all together to begin. Drop the cigarette, strike a match, hell use a berz-o-matic torch if you want to for the ignition source. Further, you could place the experiment in a chimney, a wind tunnel, or stick a wick into the snout if you'd prefer. If this "spontaneous hog combustion" happens only in special circumstance, set up that circumstance.

Frankly, if any major part of the hog is consumed, I will stand amazed and corrected. My common sense tells me that what you will have is a charred pig, but a pig nonetheless.

Simple enough test.

I and other readers of SKEPTICAL INQUIRER await the results.

And, thanks for a great magazine.

Richard L. Roberto
Ravenna, Ohio

Joe Nickell replies:

James M. Price correctly calls attention to the way smoldering combustion can replace open flames in enclosed spaces. Virtually all alleged SHC cases have occurred indoors, which is also where drugged or infirm or careless people have encountered oil lamps, open fires, and other sources of danger.

I thank Mr. Price for his thoughtful and informative contribution to this discussion.

In contrast, the letter of Richard L. Roberto shows a lack of understanding of basic premises. Roberto appears not to know where the burden of proof lies in such matters. It is always with the advocate of an idea and not on anyone else to prove otherwise.

Nevertheless, the experiment Roberto suggests is already frequently carried out—with some success, using human bodies—on the funeral pyres of India, albeit these are invariably outdoors. For Roberto's proposal to be valid, we would need a relatively enclosed space of some size—a house or apartment for example. Does Roberto have one to contribute?

Before we go to such extremes, let proponents offer persuasive evidence for a single instance of spontaneous human combustion or, using Roberto's own equation, hog combustion. Why, he should ask himself, do farmers not report such a phenomenon among their pigs, sheep, cattle, and other animals? It appears to have something to do with their relatively fire-free environment, their lack of clothing, and their drug- and alcohol-free lifestyles.

Conspiracy Theories and Paranoia

The following by Evan Harrington is his reply to the letters in the January/February issue (and to several communications directly to him) about his article "Conspiracy Theories and Paranoia: Notes from a Mind-Control Conference" (September/October 1996).—EDITOR

It is true that there are few reliable data on what the typical *member of the militia movement believes. Some have argued that members of the militia movement have been unfairly stereotyped as rabid racists. While it is quite accurate to say that much of the militia movement is rooted in the extremely racist rhetoric of the Christian Identity movement (Aho 1990) or in other racist ideologies (Stern 1996), we still lack the type of portrait that a random survey would give us. I suspect that a significant minority of militia members are simply people fed up with a government they see as hopelessly corrupt and incompetent, are not at all racist, and do not believe in conspiracy theories. However, the premise that the militia movement has a basis in racist ideology and fosters hatred is, I believe, beyond dispute.*

The therapists described in my article are in no way representative of the typical therapist who treats recovered memories, and I was somewhat distressed to see that some readers apparently made such an inference. At the NATO Advanced Study Institute held last summer in France, many of the top practitioners from both sides of the memory debate met and seemed to discover that the antagonistic dichotomy that has marked this debate from the beginning seemed to melt away. At least some from each side moved more toward a middle ground, where differing views were seen as reasonable. Some of the top recovered memory researchers stated that they had seen clients with false memories or false beliefs, *and some of the top false memory researchers stated that forgetting and later recall of traumatic experiences is not only plausible but clearly documented.*

The conspiratorial beliefs on display at the SITPRCA conference clearly are not representative of the beliefs of those who attended the NATO conference nor, I think, of the beliefs of recovered memory therapists in general. Furthermore, since recovered memories of satanic ritual abuse (SRA) comprise only a small minority of all recovered memories, failure to substantiate SRA does

not logically indicate that all recovered memories are in error. Indeed, the ability to confabulate a memory for an event that never occurred (like getting lost in a shopping mall or seeing grandma boiling babies in a cauldron) and the ability to forget a traumatic event for many years and then remember it are not necessarily mutually exclusive: The existence of one does not logically negate the other.

Here's an example: When I was seventeen years old I was violently mugged in New York City, where I grew up. I was painfully injured and developed a slight phobia for the spot on which the attack had taken place. I thought about the event a great deal for two years and then forgot about it. More than ten years later I bragged to colleagues about how I had grown up in the city without ever being a victim of violent crime. The next day I remembered the event in full. Some would call this a recovered memory. I certainly have no doubt that the event took place, in part because I remember the pain of my injuries, but I never told anyone so I have no corroboration. The possibility that false memories may occur does not constitute evidence that I was not mugged, but it might leave the question open for those who do not have access to my memory.

Finally, note should be made of a recent event illustrating the crossover of militia and SRA conspiracy theories. The New York Times *on October 2, 1996, reported that the prominent militia leader James "Bo" Gritz was arrested in Connecticut and charged with criminal attempt to commit kidnapping in the first degree. According to the* Times, *Gritz sought to rescue two boys he believed were being abused in a satanic cult. A letter I obtained off of the Internet that was distributed by the Militia of Montana contains a statement that the lawyer John DeCamp had been an advisor in the case prior to the arrest. I described DeCamp and his claims of a widespread satanic child-abusing cult in Nebraska at some length in my article. Additionally, at the 1996 SITPRCA conference, the trends exhibited in 1995 continued in that a wealth of militia-oriented conspiracy literature (such as the anti-Semitic* Spotlight *newspaper) was on display, and one book that was being sold by a participant at the conference put forth the theory that all homeless people are being mind-controlled by the CIA. New Orleans therapist Valerie Wolf stated that a pattern exists wherein patients first recover memories of incest, then of SRA, and finally they recover memories of mind-control abuse by the CIA. The idea that the CIA and the satanic cults are in cahoots was repeated frequently. As the cross-fertilization of ideas between these two social movements increases, we might expect more behavior like that exhibited by Gritz and more recovered memories of abuse in government mind-control projects.*

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The Mismeasure of Reason

Unfortunately, in her essay "Beyond the Rational" (Forum, November/December 1996) Gloria Leitner falls far short of "the rational." She employs several familiar but logically flawed arguments in an effort to discredit rationalism and promote the uncritical acceptance of irrational beliefs.

She claims "too many people are . . . overly rational—they think mechanistically, act automatically, and possess an arid, underused imagination and aesthetic sense." She, in effect, misdefines the a priori *rejection* of all unconventional ideas (narrow-mindedness) as "knee-jerk skepticism." (Strangely, the term "open-minded skepticism" is missing from her essay.) She continues: "People seem to need an ongoing deep dose of nonrational or emotional/aesthetic experience to develop creatively, compassionately, and joyfully." In other words, creativity, compassion, and joy are apparently impossible without the benefit of irrationality and "emotional/aesthetic experience" (the latter, of course, being "experienced" by literally everyone with an intact brain!). What rational process leads her to this sweeping conclusion?

Leitner simply *declares* that "hyperrational" people (those who refuse to believe without a rational basis) are intellectually arid, mechanistic, unimaginative, and lacking in aesthetic sensitivity. Furthermore, she employs the specious "if-then" heuristic that, if most creative, compassionate, and joyful individuals are "nonrational," then "nonrationality" must be essential for emotional/mental health.

Presumably, such unflinching rationalists as the late Isaac Asimov and Richard Feynman are prime examples of "overrational" people. After all, they were both staunch advocates of rigorous, open-minded skepticism. Yet it's hard to imagine two more creative, humorous, joyful, and otherwise intellectually fertile individuals. I, too, profoundly enjoy art, music, literature, and humor. In fact, I not only appreciate a good fantasy, I enjoy writing fiction. On the other hand, I have no trouble distinguishing fantasy from reality.

Robert Imrie
Seattle, Wash.

Gloria J. Leitner replies:

If Mr. Imrie believes he can distinguish fantasy from reality, he should be able to distinguish his fantasy of what I said from the reality of what I actually wrote. Certainly I had no intention of discrediting rationalism in its entirety or promoting "an uncritical acceptance of irrational beliefs," as he claims. Perhaps his misinterpretation of my remarks illustrates precisely the kind of one-dimensional thinking the essay deplores: the automatic tendency of skeptics to denounce those who defend the role of the nonrational in life (including spirituality). Or did he simply confuse my praise of the nonrational *with what he imagined was my praise of the* irrational*?*

Ironically, Mr. Imrie's comment that he enjoys art, music, and literature indicates he probably appreciates the nonrational more than the remainder of his rhetoric would imply.

Fantasy Remains Inviolate

Having, over the years, watched numerous supposedly factual programs on TV about UFOs, alien abductions, government coverups, armed forces coverups, conspiracies, etc., I believe that the following quotation applies: "As man needs fantasy upon which to thrive, fantasy itself must remain inviolate to the continuous probes of curiosity."

I don't know who authored the quotation or where I read it, but it summarizes my feelings ever since I first heard of

UFOs. I can't help but feel that the sense of mystery is being used to sell books and enhance ratings, so the media moguls must think, "Why not perpetuate what sells?"

My first subscription to SKEPTICAL INQUIRER was given to me by my son, Wayne, and for the first time, I felt I was in good company.

Ed Orlicki
El Cajon, Calif.

Let's Make Money!

I am a long-time supporter and skeptic. Like many of your readers, I suppose, I have been shocked by the alarming level of scientific illiteracy and, O.K., I'll say it, the gullibility of the general public. It seems there's no belief system so outlandish that it won't be embraced by millions of people either unwilling or unable to think rationally. Until recently, I actually thought this was a *bad* thing. Then, in a blinding flash of inspiration, it hit me: this could be the biggest business opportunity since the Earl of Sandwich first placed mustard between two slices of bread (he later improved on the idea).

My first thought was to found a science-fiction religion with myself as some sort of demigod, surrounded by the Baywatch Babes (oh sure, like you haven't thought about it), but somebody beat me to it, complete with aliens and really cool electronic gizmos. Personally, I thought the aliens were a stretch, but hey, you can't argue with success. Next, I briefly considered selling ordinary water as a cure-all for everything from acne to tennis elbow. But the homeopathists had already made their move, setting up a pretty slick marketing and distribution network. Too much competition, though the product is *remarkably* cheap to manufacture.

O.K., I need ideas, but I'm willing to share the wealth. I propose that we skeptics band together and form a new company called PSI-Corp, CSICOP's evil twin, if you will. Don't worry—if they're smart enough to make the connection, odds are they wouldn't have been customers anyway. Barring the unlikely event of a massive improvement in science education, the market for pseudoscience is virtually insatiable. People will flock to us like pigeons to an open convertible (sorry, that's a disgusting analogy if you think about it, but it sounded much better in the middle of the night). We can solicit ideas from *SI* readers, an ocean of untapped potential, I'm sure. Just remember, no idea is so crazy that people won't fall for it if you write a few books, do some TV, and market it with conviction. I just ask that your readers stop supporting public television, education, and our youth, and stay home, uninvolved, lest they wreck everything.

Finally, as our new company will need officers, I selflessly volunteer to serve in the role of demigod, uh sorry, CEO.

Darrell Yocom
Lakewood, Calif.

In the Eye of the Beholder

I am much impressed by the very attractive female pictured on page 57 of your November/December issue. Speculation here is that her father is a centaur and her mother is a sea anemone. I'd volunteer to be abducted by *her*!

John A. Ball
Harvard, Mass.

Progress and Doomsdays

Professor Ted Lewellen's pitiful defense of the Club of Rome (Letters, November/December, "Iconoclastic Teaching . . .") makes me laugh and recall the cases of the cult leaders who calculate the Apocalypse will occur on a certain date, three years hence. When the faithful gather on the hilltop on the appointed date, and nothing happens, the leader makes a new calculation, and discovers he has made a mistake, and it is really ten years from now!

When the Club of Rome, in the '70s, was quoted as predicting worldwide famine in the mid '80s, no one from the Club of Rome disputed the published reports. When scientific progress (Super Wheat and Super Rice) caused food production to outpace population growth, there was egg on the face of the Club of Rome; and at that time (right after the mid-'80s) we heard nothing of Lewellen's claimed Club of Rome 2040 prediction.

The latest from the fear-mongers is that we will run out of potable water (I think I remember correctly) in 2010. Of course, it has also been predicted that we only have a twenty-year supply of oil reserves left, every ten years for the last half century! Somehow, we keep improving our technology and finding more oil, or improving our agriculture, or melting icebergs.

C. Norman Winningstad
Chairman, ThrustMaster, Inc.
Newport, Ore.

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We donated a subscription to our local library this year. We hope other readers will be encouraged to take this tangible step toward promoting science and reason.

Sherri and Dennis McCarthy
Fairport, N.Y.

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